



IMMEDIATE RESPONSE ACTION PLAN

Status Report 11

Cape Cod Gateway Airport
Hyannis, Massachusetts

RTN 4-26347

April 2022



Prepared for:
Cape Cod Gateway Airport
480 Barnstable Road Hyannis,
MA 02840

Prepared by:
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IMMEDIATE RESPONSE ACTION PLAN STATUS REPORT 11
CAPE COD GATEWAY AIRPORT
HYANNIS, MASSACHUSETTS
RTN 4-26347

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1.0 INTRODUCTION

The Horsley Witten Group, Inc. (HW) has been retained by the Cape Cod Gateway Airport (the “Airport”), formerly known as the Barnstable Municipal Airport, to develop this eleventh Immediate Response Action (IRA) Plan Status Report for its property at 480 Barnstable Road, Hyannis, Massachusetts (Figure 1). HW has prepared this report in accordance with the Massachusetts Contingency Plan 310 CMR 40.0000 (MCP) on behalf of:

Ms. Katie Servis, Airport Manager
Cape Cod Gateway Airport
Hyannis, Massachusetts 02601
(508) 775-2020

The report describes IRA related activities conducted between October 2021 and April 2022.

2.0 SUMMARY OF IRA PLAN AND IRA MODIFICATION

An IRA was initiated in response to a Notice of Responsibility (NOR) for Release Tracking Number (RTN) 4-26347 dated November 10, 2016, issued to the Airport by the Massachusetts Department of Environmental Protection (MassDEP). The NOR requested that the Airport conduct additional field investigations to evaluate:

- The source(s) of Per- and Poly-Fluoroalkyl Substances (PFAS) including perfluorooctanesulfonic acid (PFOS) and perfluorooctanoic acid (PFOA) previously detected in groundwater at the Airport and several adjacent properties;
- The source(s) of 1,4-dioxane, previously detected in a monitoring well downgradient of the Airport on the Maher wellfield property; and
- To identify potential impacts to public water supply wells operated by the Hyannis Water District at the Mary Dunn and Maher wellfields.

A proposed IRA plan was submitted for approval in response to the NOR. Subsequently, a meeting was held by MassDEP at the Airport that included other stakeholders including the Barnstable Department of Public Works, the Hyannis Water District, and Barnstable County representatives (representing the Fire Training Academy). At the meeting, IRA plans were coordinated between the Airport and Fire Training Academy including sampling locations, type of analysis, groundwater modeling, goals, and next steps. The IRA plan served as the guide for the soil and groundwater testing conducted since November 2016 to follow up on the results of the previous analyses.

In June 2019, the MassDEP issued a Request for Modified Immediate Response Action Plan/Interim Deadline dated June 18, 2019 (the “Modified IRA Request”) to the Airport. The Modified IRA Request asked that the Airport propose response actions to *“reduce infiltration of precipitation through PFAS-impacted soil, such as temporarily capping the source areas; excavating and properly disposing of the PFAS-impacted soil; or some equivalent approach”*.

The Airports response is documented in the report titled *Final Immediate Response Action Plan Modification*, prepared by HW and dated December 2019 (the “IRA Modification”). The IRA Modification included details for the installation of a cap in two select areas to reduce precipitation infiltration. The two areas are identified as the Deployment Area and the Airport Rescue and Fire Fighting/Snow Removal Equipment (ARFF/SRE) Building Area. The two capped areas total approximately 94,100-square feet and represent a majority of the known PFAS in soil source areas relating to the historic application of aqueous film forming foam (AFFF) by the Airport. Areas of PFAS in soil remaining above the applicable Method 1 soil standard located outside of the capped area are indicated on Figure 2. Evaluation of these areas will be included in future response actions and/or included as part of a future risk assessment.

2.1 Background

Prior to issuance of the NOR, the Airport had conducted investigations on both 1,4-dioxane and PFAS and provided the results to MassDEP. In July 2015, HW sampled groundwater from seven groundwater monitoring wells for 1,4-dioxane. This contaminant was detected in groundwater monitoring well OW-9DD located in the Maher wellfield at a concentration of 0.926 micrograms per liter (ug/L). This concentration is above the applicable Method 1 standard of 0.30 ug/L. This groundwater monitoring well is screened from 77 to 87 feet below the ground surface.

At that time, it was thought that potential sources of 1,4-dioxane at the Airport could be related to a historic release of 1,1,1-trichloroethane (1,1,1-TCA) from an oil/water separator associated with a floor drain in the former Provincetown Boston Airlines hangar (currently leased to Cape Air) and/or from the application of deicing fluid. Given the screen depth of monitoring well OW-9DD, the 1,4-dioxane may also be from an off-Airport source.

On August 4, 2016, MassDEP issued a Request for Information (RFI) to the Airport requiring investigation of PFAS. On July 1 and 5, 2016, HW collected samples from six groundwater monitoring wells and submitted the samples for laboratory analysis of PFOS and PFOA. These compounds were detected in each of the wells tested. At monitoring wells HW-3 and HW-5, the sum of PFOS and PFOA were 0.0931 and 0.151 ug/L respectively, above the EPA health advisory limit and applicable MassDEP standard. PFOS and PFOA were also detected above the EPA health advisory limit and applicable MassDEP standard in monitoring well HW-1, located at the upgradient, western boundary of the Airport. Additional details about 1,4-dioxane and PFAS are included in the Revised Phase II Comprehensive Site Assessment Report submitted to the MassDEP in January 2022 (the “Revised Phase II Report”).

2.2 Actions Under the IRA Plan

A summary of the IRA activities conducted between October 2021 and April 2022 include:

- Soil sampling for PFAS; and
- Groundwater Sampling for PFAS.

As indicated in the Revised Phase II, the Airport is not the source of 1,4-dioxane and as such, additional delineation of the non-airport related source(s) of 1,4-dioxane will not be completed.

3.0 APPLICABLE MCP STANDARDS

Pursuant to 310 CMR 40.0900, the characterization of risk of harm to health, safety, public welfare, and the environment must be evaluated at each disposal site. This characterization includes the determination of site-specific soil and groundwater categories based on site location and use, and the comparison of laboratory results to these standards (310 CMR 40.0930).

In accordance with 310 CMR 40.0933, the applicable soil category is selected based upon the frequency, intensity of use, and accessibility of the Airport by adults and children. Based on these criteria, soil at the Airport is category S-1/GW-1 and S-1/GW-3.

Groundwater located within a Current Drinking Water Source Area is considered category GW-1. The Airport is located within several zones of contribution (Zone II) for Barnstable Village, the Hyannis Water District, and the Town of Yarmouth. Zone IIs are considered current drinking water sources as defined in 310 CMR 40.0006; thus, category GW-1 is applicable.

Groundwater located within 30 feet of an occupied building that has an average annual depth of less than 15 feet is categorized as GW-2. This is primarily a concern because of the possibility of vapor impacts to indoor air. The average annual depth to groundwater at the Airport is greater than 15 feet; therefore GW-2 Standards do not apply. Also, all disposal sites shall be considered a potential source of discharge to surface water, and therefore categorized as GW-3. Based on these criteria, categories GW-1 and GW-3 are applicable to the Airport.

The soil and groundwater standards applicable to the Airport for PFAS and 1,4-dioxane as described in the document titled Final PFAS – Related Changes to the MCP – 2019-12-13 prepared by the MassDEP and promulgated December 27, 2019 are as follows:

PFAS Standards				
Analyte	Soil Standard (ug/kg)		Groundwater Standard (ug/l)	
	S-1/GW-1	SW-1/GW-3	GW-1	GW-3
Pefluorodecanoic Acid (PFDA)	0.3	300	N/A	40,000
Perfluoroheptanoic Acid (PFHpA)	0.5	300	N/A	40,000
Perfluorohexanesulfonic Acid (PFHxS)	0.3	300	N/A	500
Perfluorononanoic Acid (PFNA)	0.32	300	N/A	40,000
Perfluorooctanesulfonic Acid (PFOS)	2	300	N/A	500
Perfluorooctanoic Acid (PFOA)	0.72	300	N/A	40,000

PFAS Standards				
Analyte	Soil Standard (ug/kg)		Groundwater Standard (ug/l)	
	S-1/GW-1	SW-1/GW-3	GW-1	GW-3
PFAS Sum of Six*	N/A	N/A	0.02	N/A

* PFAS Sum of Six is the sum of PFDA, PFHpA, PFHxS, PFNA, PFOS, and PFOA

1,4-dioxane			
Soil Standard (ug/kg)		Groundwater Standard (ug/l)	
S-1/GW-1	SW-1/GW-3	GW-1	GW-3
200 ug/kg	20,000 ug/kg	0.3	50,000

4.0 HISTORIC FIELD INVESTIGATIONS

Historic field investigations conducted at the Airport since the November 2016 NOR and documented in prior IRA status reports are summarized below:

- An initial round of three soil samples were collected on December 9, 2016. One sample was taken from each location where it was determined that AFFF had been used at the Airport. The areas included the MCI Drill Area, the Deployment Area, and the 1991 Drill Location.
- The installation of groundwater monitoring wells at six locations in April 2017: in the vicinity of potential sources of PFAS at the ARFF/SRE Area, at the Deployment Area and at upgradient locations outside of the Airport to evaluate potential off-site sources of PFAS and 1,4-dioxane.
- Groundwater from the new wells was initially sampled for PFAS and 1,4-dioxane in April 2017. Additional groundwater samples and one surface water sample were collected for analysis of PFAS on June 20, 2017.
- A second round of soil samples were collected on June 20, 2017 adjacent to the ARFF/SRE Building and within the Deployment Area to begin to determine the extent of PFAS within the surface soils. Based on the results of these analyses, a third round of samples from these two locations were collected on September 26, 2017. The third round of sampling was designed to further delineate the extent of PFAS in soils both horizontally and vertically, with samples taken at the ground surface and at two and four feet below ground surface (BGS).
- One sample of AFFF concentrate was analyzed for PFAS compounds. The analysis was inconclusive (only 225.5 ug/l of total PFAS was detected) and it is assumed that the sample was not homogeneous (i.e., had separated in the foam bucket) and that the

addition of water to the concentrated may affect how precursor PFAS analytes transform into various other detectable PFAS compounds.

- Six soil samples were analyzed for PFAS leaching potential using a synthetic precipitation leaching procedure (SPLP) test between September and October 2017. The chosen samples included four samples from the Deployment Area and two samples from runway reconstruction soils stockpiled at the Airport.
- In October 2017, 20 surface samples were collected both on and off Airport property to determine the concentration of PFAS in the area.
- In October 2017, three composite soil samples were taken from piles of soil associated with the redevelopment of Runway 15/33. These piles were located on Airport property at the site of the former Mildred's Restaurant and were analyzed for PFAS compounds to evaluate if soil removed from the Airport as part of this redevelopment contained PFAS.
- On August 14, 2018, 24 PFAS surface soil samples were collected in proximity to the ARFF/SRE Building Area and the Deployment Area. PFAS compounds were previously detected in these areas and additional samples were collected to determine the vertical extent of PFAS impacts in soil and to refine the soil disposal site boundary at the Airport.
- In October 2018, three soil borings (DL11, DL14 and HW-F) were advanced in the Deployment Area. One soil boring (ARFF3) was advanced, and one surface soil sample (HW-3) was collected near the ARFF/SRE Building in order to further delineate the extent of PFAS in soils both horizontally and vertically.
- In October 2018, six monitoring wells were installed at the Airport. A cluster of three wells (HW-G(s), HW-G(m), and HW-G(d)) was installed at an upgradient location to evaluate potential off-site sources of PFAS. Three additional wells (HW-H, HW-I, and HW-J) were installed southeast of the Deployment Area adjacent to the East Ramp.
- In November 2018, six groundwater samples were collected to evaluate PFAS concentrations in the Deployment Area. Four groundwater samples and one surface water sample from Mary Dunn Pond were also collected for analysis of oxygen and hydrogen isotopes to determine the contribution of pond water from Mary Dunn Pond to the four downgradient monitoring wells. The analysis was inconclusive in tracing the contribution of pond water in the downgradient monitoring wells.
- In December 2018, two soil samples were collected from the 1991 Drill Location to determine if PFAS detected in the area are related to background conditions.
- In December 2018, 12 groundwater samples were collected for analysis of PFAS and 13 groundwater samples were collected for analysis of oxygen and hydrogen isotopes to determine the contribution of pond water from Mary Dunn Pond to the 13

downgradient wells. Groundwater samples were also collected from four monitoring wells in the Maher Wellfield for analysis of 1,4-dioxane.

- In February 2019, three additional surface soil samples were collected to further delineate the soil Disposal Site boundary around the ARFF/SRE building.
- In May and June 2019, HW installed nine groundwater monitoring wells to delineate the vertical and horizontal extent of PFAS and 1,4-dioxane at the Airport and on adjacent hydraulically upgradient properties.
- In June 2019, eight groundwater samples were collected from newly installed groundwater monitoring wells HW-L, HW-K, HW-I (m), HW-I (d), HW-M, HW-D(d), HW-D (dd), and HW-N for PFAS.
- In July 2019, one groundwater sample was collected from the newly installed groundwater monitoring wells HW-O for PFAS. One groundwater sample was collected from HW-L for 1,4-dioxane.
- In July 2019, two surface water samples were collected from Upper Gate and Lewis Ponds for PFAS analysis.
- In August 2019, four groundwater samples were collected from monitoring wells HW-N, HW-A(d), HW-O, and HW-1 to evaluate potential sources of 1,4-dioxane entering the Airport from unknown upgradient sources(s). One groundwater sample was also collected from groundwater monitoring well HW-E for PFAS.
- In August 2019, soil sample DL 11 (0-1) was collected from the Deployment Area.
- In August 2019, six spray water samples were collected from discharge locations on a fire truck at the Airport. The samples were collected to verify that the valve mechanism that controls the mixing of AFFF with water was working appropriately. PFAS should not be detected in the spray water. Although the spray water is not considered drinking water, PFAS was detected in each of the six samples collected above the GW-1 standard.
- On September 27, 2019, HW collected groundwater samples from six monitoring wells located on the Airport for 1,4-dioxane analysis.
- In November 2019, the Airport replaced the valve mechanism in the fire truck to ensure that AFFF was no longer mixing with the water despite the mechanism not being engaged. In December 2019, HW resampled the six discharge locations from the fire truck at the Airport. PFAS was detected at various concentrations at each location, but all were below the GW-1 standard.
- Between May 5th and May 21st, 2020 HW collected 16 groundwater samples PFAS analysis. Refer to Table 2 for groundwater results.

- Between May 5th and May 13th, 2020 HW collected groundwater samples from four monitoring wells for 1,4-dioxane analysis.
- Between September 14th and September 24th, 2020 HW and Desmond Well Drilling installed 13 monitoring wells.
- On September 17, 2020 HW collected groundwater samples from the three Maher Wells (ME-1 through ME-3) for PFAS analysis.
- Between September 14th and September 30th, 2020 HW collected 23 soil samples for PFAS analysis.
- Between October 1 and October 7 2020, HW collected groundwater samples from 16 monitoring wells for PFAS.
- On October 2 and 7, 2020 HW collected groundwater samples from four monitoring wells for 1,4-dioxane analysis.
- Between November 5 and 6, 2020 HW collected five groundwater samples for PFAS analysis.
- On November 17, 2020 HW collected two roof samples (rubber membrane and asphalt shingle) from the ARFF/SRE building for SPLP PFAS. The testing was completed to determine if roofing materials were a potential source of PFAS in groundwater through stormwater infiltration. PFAS was detected in each of the samples collected. Although the leachate is not considered drinking water, the concentration of the MassDEP Sum of 6 were below the Method 1 GW-1 and GW-3 standards.
- On February 18 and 19th, 2021 HW conducted hydraulic conductivity testing at three monitoring well locations. Refer to the Revised Phase II Report for additional details.
- Between March 17th and March 19, 2021, HW collected 21 groundwater samples from the following monitoring wells for PFAS analysis as part of the first round of post-cap semiannual monitoring:

HW-R(s)	HW-I(d)	HW-2	HW-S(m)	RB-1(m)	OW-19(d)
HW-J	HW-E	HW-3	HW-P(s)	HW-K	
HW-I(s)	HW-F	HW-300	HW-P(m)	OW-19(s)	
HW-I(m)	HW-302	HW-S(s)	RB-1(s)	OW-19(m)	

- Between April 5th and April 7th, 2021, HW and Desmond Well Drilling installed monitoring wells HW-U(s), HW-U(m), HW-W(m), HW-W(d), and HW-W (dd).
- Between April 6th and 19th, 2021, HW collected 17 soil samples for TOC analysis. The TOC samples were collected from various depths between ground surface and 65 feet below grade. The TOC data is being used to determine plume migration.

- On April 19, 2021, HW sampled the recently installed monitoring wells HW-U(s), HW-U(m) HW-W(m), HW-W(d), and HW-W (dd) for further analysis of PFAS compounds in groundwater.
- On September 7, 2021, HW and New England Geotech installed monitoring wells HW-X(s) and HW-X(m). The monitoring wells were installed adjacent to the former ARFF/SRE Building.
- On September 7, 2021, HW collected a soil sample from HW-X (m) and submitted it for PFAS analysis. None of the MassDEP six regulated PFAS compounds were detected above the laboratory method detection limit.
- On September 10, 2021, HW collected groundwater samples from HW-X (s) and HW-X(m) and submitted them for PFAS and 1,4-dioxane analysis.
- Between September 1 and September 11, 2021 HW collected 26 groundwater samples from the following monitoring wells for PFAS analysis as part of the second round of post cap semiannual monitoring:

HW-R(s)	Hw-I(d)	HW-2	HW-S(m)	RB-1(m)	OW-19(d)
HW-J	HW-E	HW-3	HW-P(s)	HW-K	HW-W(m)
HW-I(s)	HW-F	HW-300	HW-P(m)	OW-19(s)	
HW-I(m)	HW-302	HW-S(s)	RB-1(s)	OW-19 (m)	
HW-W(dd)	HW-U (s)	HW-U(m)	HW-U (d)	HW-W(d)	

- On September 10, 2021, HW collected two groundwater samples from monitoring wells HW-E and HW-J located in the Deployment Area for 1,4-dioxane. 1,4-dioxane was not detected above the laboratory reporting limit.

Soil, surface water and groundwater sampling locations are indicated on Figures 2 through 6. Tabulated analytical data are included on Tables 1 through 10. Laboratory data packages and soil boring logs associated with historic field investigations have previously been submitted to MassDEP and are available in other IRA Status Reports and phased reports (i.e., Phase II)

5.0 FIELD INVESTIGATIONS CONDUCTED DURING THE CURRENT REPORTING PERIOD

Details concerning field investigations conducted between October 2021 and April 2022 are summarized below.

- On March 2nd and 4th, 2022, HW collected 6 surficial composite soil samples from Runway 6-24 at the locations on Figure 7 and submitted them to Alpha Analytical for PFAS analysis. Runway 6-24 will be redeveloped in 2022-2023 and the soil testing was conducted to evaluate how soils removed from the areas around the runway would need to be managed if they were taken off site. None of the MassDEP six regulated PFAS compounds were detected above the applicable Method 1 Standard. Analytical results are included on Table 11 and laboratory reports are include in Appendix A.

- Between March 15th and March 31st, 2022, HW collected 29 groundwater samples from the following monitoring wells for PFAS analysis as part of the third round of post cap semiannual monitoring:

HW-R(s)	Hw-l(d)	HW-2	HW-S(m)	RB-1(m)	OW-19(d)
HW-J	HW-E	HW-3	HW-P(s)	HW-K	HW-W(m)
HW-l(s)	HW-F	HW-300	HW-P(m)	OW-19(s)	HW-4(m)
HW-l(m)	HW-302	HW-S(s)	RB-1(s)	OW-19 (m)	HW-5
HW-W(dd)	HW-U (s)	HW-U(m)	HW-U (d)	HW-W(d)	

At the time of this report, analytical results have not been provided by the laboratory. Analytical data packages and tabulated data will be included in the next MassDEP submission.

6.0 BI-ANNUAL CAP INSPECTION AND CAP PERFORMANCE MONITORING

HW inspected the asphalt cap on April 6, 2022 in the vicinity of the ARFF/SRE Building. The asphalt cap was free of cracks and significant depressions as indicated in the photos below.



HW inspected the geomembrane cap on April 6, 2021, in the vicinity of the Deployment Area. The sand and loam protective layer over the geomembrane cap were intact with no signs of significant erosion as indicated in the photos below.



As indicated above, HW collected 29 groundwater samples as part of the semi-annual cap inspections to determine the effectiveness of the caps. The groundwater analytical data was not available at the time of this report. Groundwater analytical data will be included in the next status report to MassDEP.

The first two rounds of post-cap monitoring are extremely promising and show a substantial decrease in PFAS concentrations in the shallow groundwater in the immediate vicinity of the cap as indicated on Table 12.

HW will continue to inspect the two cap areas every six months and collect groundwater samples from select existing monitoring wells to document the effectiveness of the caps. The next cap inspection and groundwater sampling event will take place in September 2022.

7.0 GROUNDWATER MODELING AND CONTAMINANT TRANSPORT ANALYSIS

A full evaluation of the groundwater plumes associated with the releases at the deployment area and the ARFF building sites are included in the Revised Phase II Report submitted to MassDEP in January 2022. Additional groundwater testing and forensic techniques will be utilized to further refine the groundwater contaminant fate and transport characteristics.

8.0 UPGRADES TO AFFF TESTING PROTOCOLS AT THE AIRPORT

The Airport has purchased an Ecologic Foam Test System to allow the Airport to test the AFFF delivery systems on its current fire trucks without having to discharge the foam into the environment. The use of the new system meets the Federal Aviation Administration requirements for the regular testing of AFFF usage. Therefore, it is anticipated that no further foam will be deployed at the Airport except during an emergency situation when its use is required.

The Airport received a new fire fighting vehicle that deploys AFFF to replace an older fire fighting vehicle in the Airport's fleet. The FAA requires that AFFF be discharged from new

equipment at the delivery location before the equipment enters service to verify that the vehicle systems operate normally and produce the appropriate AFFF mixture. The information from the AFFF discharge test will also be used to calibrate the AFFF consistency for future testing using the Ecologic cart so that future AFFF deployment will not be necessary.

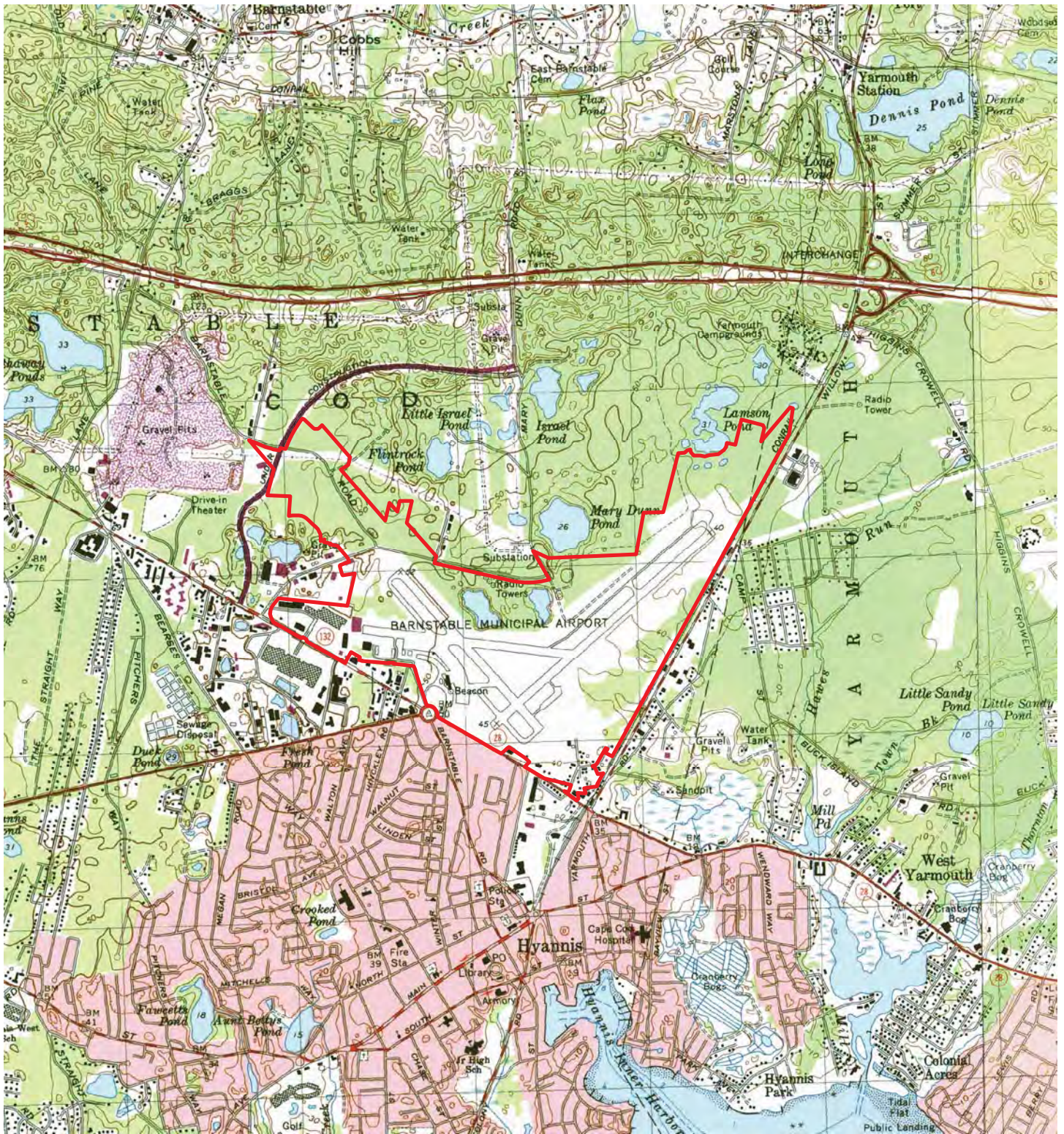
Appropriate precautions will be initiated to limit the possibility of a release of AFFF to the environment during the required testing. These precautions will include discharging AFFF into a closed vessel such as a fractank or other sealed container, the placement of polyethylene sheeting and visual monitoring by HW. The discharge container will be cleaned, and the contents disposed of by a licensed waste disposal company. Polyethylene sheeting will be placed in a 55-gallon drum for off-site disposal by a licensed waste disposal company. The testing event will be conducted inside an airport facility with floor drains connected to an oil water separator and sanitary sewer to ensure any AFFF that is not contained within the vessel or sheeting is not released into the environment. The testing event will be documented in a status report along with photographic documentation. The testing event is expected to be conducted within during the next reporting period.

9.0 PLANS FOR NEXT REPORTING PERIOD

HW will continue to conduct inspections of the two cap areas and monitor groundwater. Further testing of soil and/or groundwater is planned to refine the disposal site boundaries in the Deployment Area and ARFF Building Area. Future analytical results and boring logs will be included in future status reports.

FIGURES

- 1- USGS Locus
- 2- Soil Sample Locations
- 3- Sum of Six PFAS in Groundwater
- 4- 1,4-dioxane Results in Groundwater
- 5- Background PFAS Sample Locations
- 6- TOC Sample Locations
- 7- Surficial Soil Sampling Runway 6/24 Locations

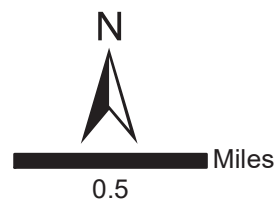


Document Path: H:\Projects\HYA\11072 (697 Barnstable Airport)\GIS_Maps\Maps\USGS_Locus_20130815.mxd

Legend

 Airport Property Line

*Hyannis Topographic Quadrangle



Horsley Witten Group
Sustainable Environmental Solutions

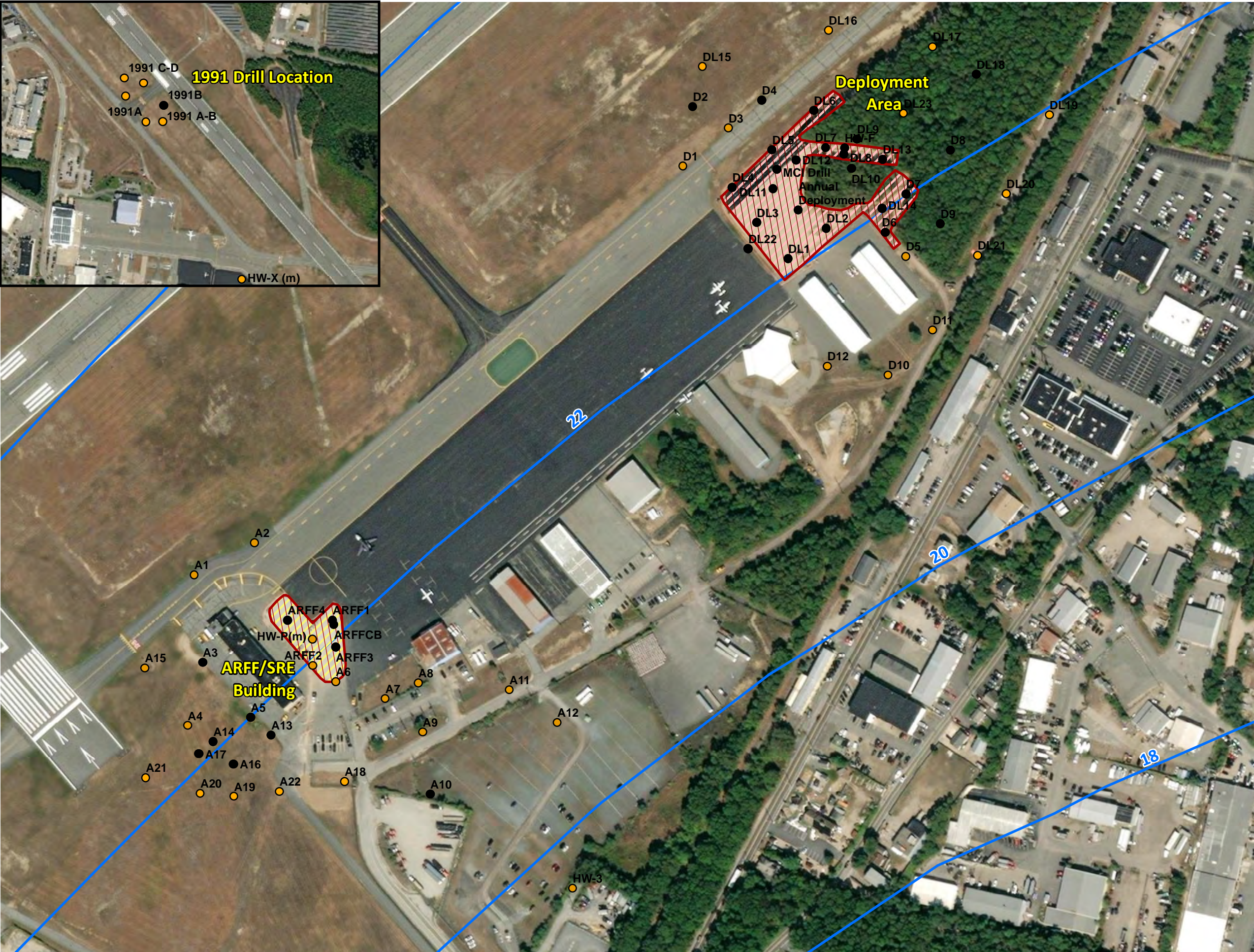
90 Route 5A • Sandwich, MA • 02563
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USGS Locus
Cape Cod Gateway Airport
Hyannis, MA

Date: 4/17/2018

Figure 1




Legend


- Groundwater Contours*
- Deployment Area Liner Cap
- ARFF Asphalt Cap
- Soil Sample Location below Method 1 S-1/GW-1 Standard for all Six PFAS Compounds
- Soil Sample Exceeding Method 1 S-1/GW-1 for at least one of the six regulated PFAS compounds

Method
PFHpA = 0.5 ug/kg
PFHxS = 0.3 ug/kg
PFOA = 0.72 ug/kg
PFNA = 0.32 ug/kg
PFOS = 2 ug/kg
PFDA = 0.3 ug/kg

Soil Sample Location for TOC



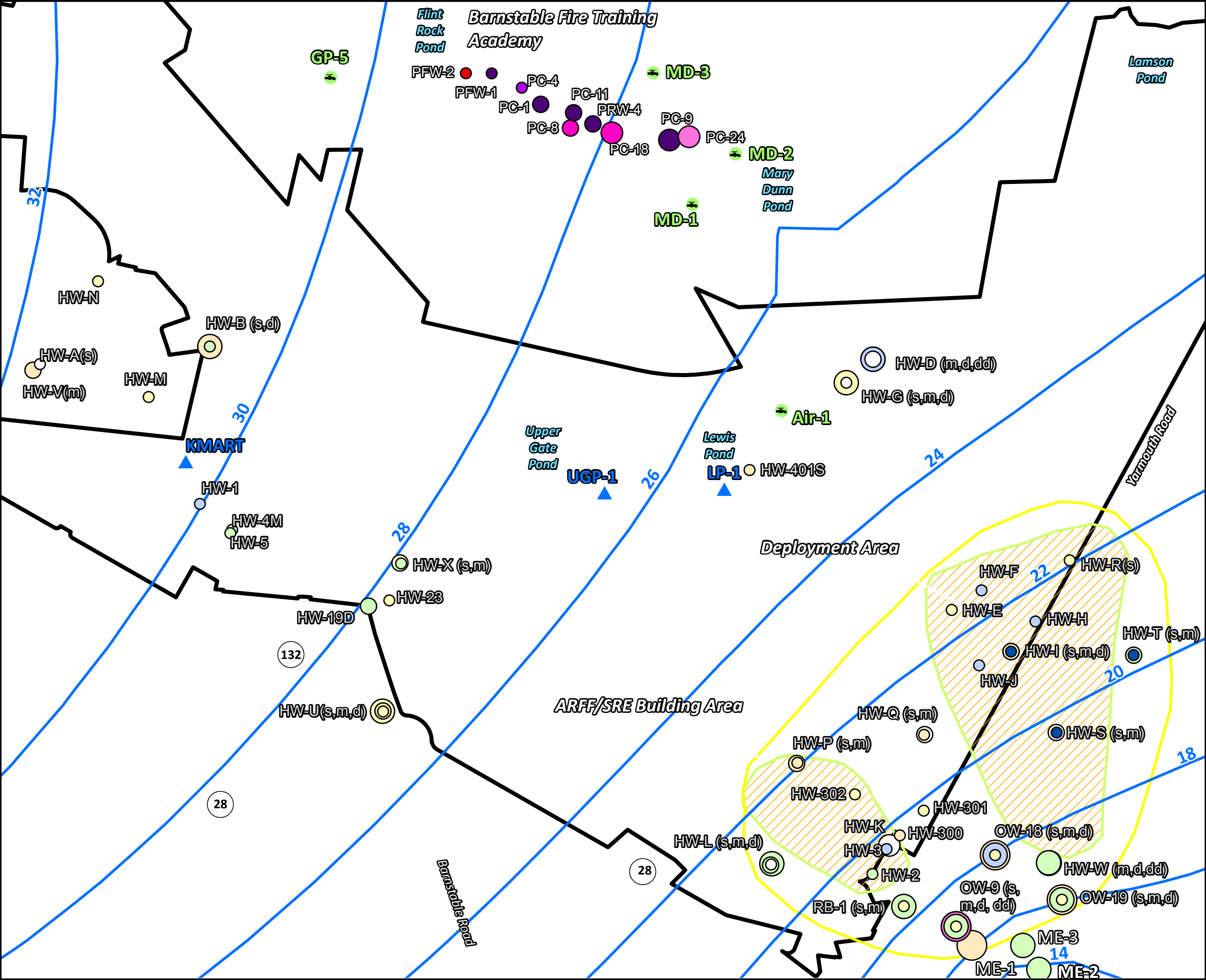
0 225
1 in = 225 feet



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Soil Sample Locations
Barnstable Municipal Airport
Hyannis, MA

* Cape Cod Commission (CCC) Groundwater Contours



Legend

Drinking Water Wells

Cape Cod Gateway Airport Boundary

Surface Water Samples

Groundwater Contours

Estimated Extent of Airport AFFF PFAS Plume

Estimated Disposal Site Boundary for Groundwater

Sum of Six PFAS Detected in Groundwater (ug/L)

0-<0.02

>0.16-0.32

>5-20

>0.02-0.04

>0.32-0.64

>20-80

>0.04- 0.08

>0.64-1.28

>80-160

>0.08-0.16

>1.28-5

Sample Depth (Feet into Groundwater)

<11 feet

>11-20 feet

>20-50

>50

Notes:

1. Multiple layers indicates samples at different depths. The larger the circle, the deeper the sample.

2. Sum of six PFAS result for all locations except the Fire Training Academy are the average from multiple sampling events between 2016 and 2021. The Fire Training Academy results are from 2016.

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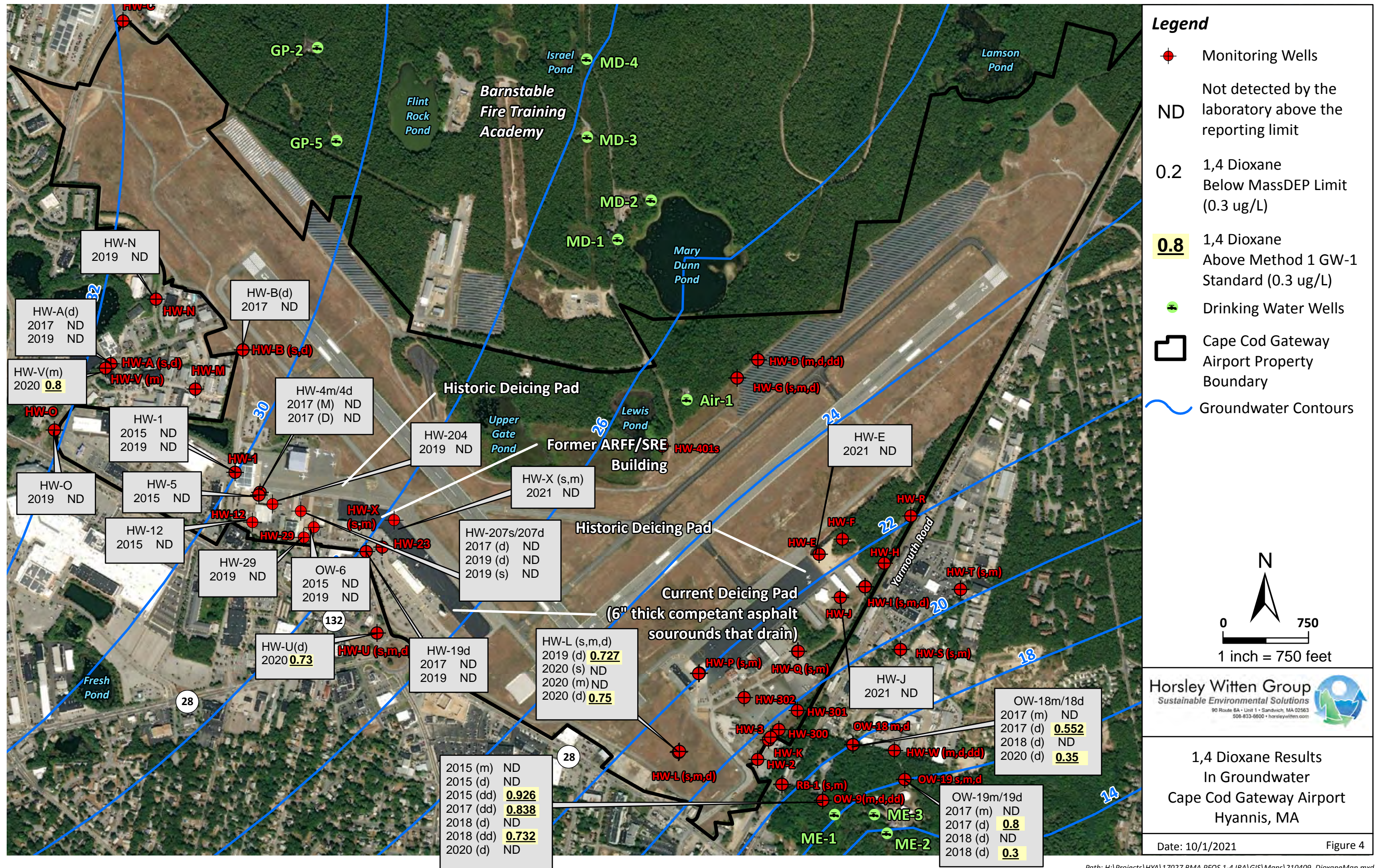
Feet

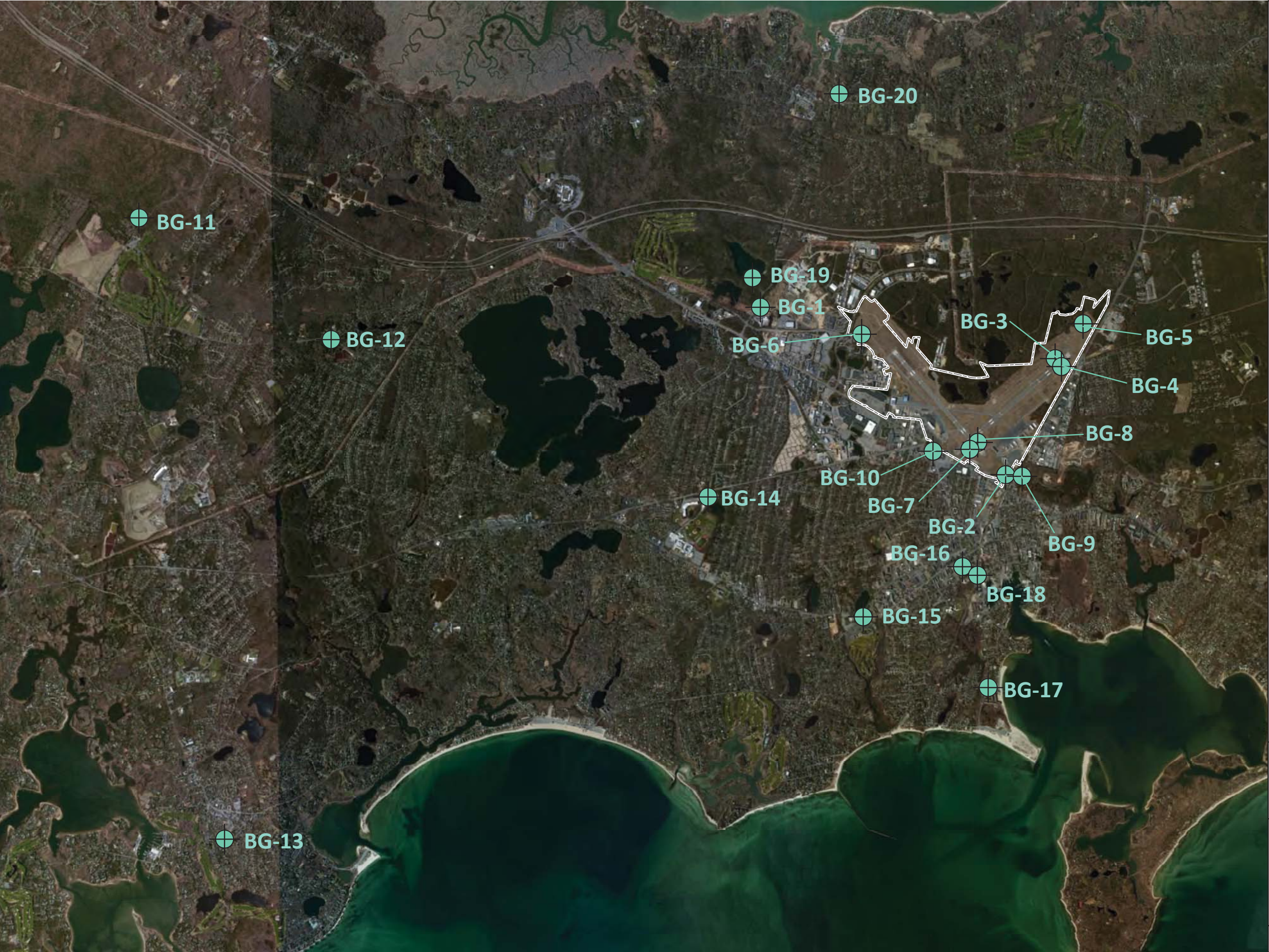
Sum of Six PFAS in Groundwater
Cape Cod Gateway Airport
Hyannis, MA

Date: 4/14/2022



Figure 4

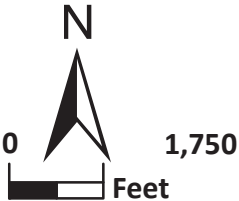
* Cape Cod Commission (CCC) Groundwater Contours





Legend

-  Background PFAS sample locations
-  Cape Cod Gateway Airport Property



Horsley Witten Group

Sustainable Environmental Solutions

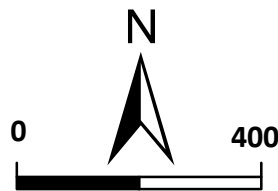
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Background
PFAS Sample Locations
Cape Cod Gateway Airport
Hyannis, MA



- Legend**
- Groundwater Contours
 - Approximate Location of TOC Sample
 - Deployment Area Liner Cap
 - ARFF Asphalt Cap



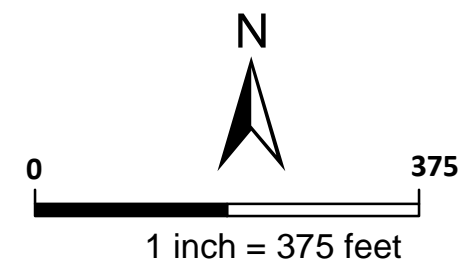
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TOC Sample Locations
Cape Cod Gateway Airport
Hyannis, MA



Legend

- Soil Sample Location 6-24 A Composite (0-1')
- Soil Sample Location 6-24 A Composite (1-2')
- Soil Sample 6-24 B (0-1') Composite Locations
- Soil Sample 6-24 B (1-2') Composite Locations
- Soil Sample 6-24 C (0-1') Composite Locations
- Soil Sample 6-24 C (1-2') Composite Locations
- Cape Cod Gateway Airport Property



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Surficial Soil Sampling
Runway 6/24 Locations
Cape Cod Gateway Airport
Hyannis, MA

Date: 3/17/2022 Figure 7

TABLES

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- 12- Select Pre and Post Cap Groundwater Results for PFAS

Table 1. Soil Results for PFAS ug/kg

Sample Location			ARFF Building																																										
Sample ID	Method 1 Standard	UCL	ARFF1 (0-1)	ARFF1 (2')	ARFF1 (4')	ARFF2 (0-1')	ARFF3 (0-1')	ARFF3 (10-12)	ARFF4 (0-1')	ARFFCB (0-1)	A1 (0-1')	A2 (0-1')	A3 (0-1')	A4 (0-1')	A5 (0-1')	A5 (2-4')	A6 (0-1')	A7 (0-1')	A8 (0-1')	A9 (0-1')	A10 (0-1')	A11 (0-1')	A12 (0-1')	A13 (0-1')	A13 (0-1')	A14 (0-1')	A14 (0-1')	A15 (0-1')	A15 (0-1')	A16 (0-1')	A17 (0-1')	A18 (0-1)	A19 (0-1)	A20 (0-1)	A20 (2-4)	A21 (0-1)	A22 (0-1)	HW-P(M) [8-10]	HW-P(M) [18-20]	DL1(0-1)					
Sample Date	S-1/GW-1	S-1/GW-3	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	10/6/2018	9/26/2017	9/26/2017	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	9/24/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	2/27/2019	9/29/2020	2/27/2019	5/13/2020	2/27/2019	5/13/2020	9/17/2020	9/17/2020	9/29/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	9/24/2020	6/20/2017				
Perfluorheptanoic acid (PFHpA)	0.5	300	4,000	0.82 J	1.8	0.66 J	0.17 U	0.60 J	0.32 J	0.75 J	0.60 J	0.19 U	0.19 U	0.38 J	0.19 U	1.1	0.089 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	<2.0	0.396 J	<1.9	0.51 J	<2.0	0.21 U	0.067 J	1.07	0.076 J	0.101 J	0.09 U	0.045 U	0.096 J	0.044 U	0.043 U	0.30 J						
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	0.23 U	0.23 U	0.23 U	0.23 U	0.64 J	0.24 U	0.23 U	0.23 U	0.24 U	0.24 U	0.24 U	0.24 U	0.12 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	<2.0	0.058 U	<1.9	0.24 U	<2.0	0.21 U	0.085 J	0.058 U	0.054 U	0.059 U	0.121 U	0.121 U	0.06 U	0.055 U	0.059 U	0.058 U	0.23 U					
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	0.75 J	2.6	0.73 J	0.26 U	0.78 J	1.9	0.97 J	0.90 J	0.25 U	0.25 U	0.27 J	0.30 J	1.9	0.228 J	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	0.25 U	<2.0	0.67 J	<1.9	0.68 J	<2.0	0.14 U	0.088 J	0.989	0.111 J	0.129 J	0.196 J	0.147 J	0.042 U	0.089 J	0.046 J	0.26 U						
Perfluorononanoic acid (PFNA)	0.32	300	4,000	2.5	5.7	1.4	0.17 U	0.91 J	3.1	2.9	0.17 U	0.22 U	0.22 U	0.55 J	0.22 U	0.87 J	0.148 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	<2.0	1.2	<1.9	0.54 J	<2.0	0.15 U	0.119 J	0.774 J	0.28 J	0.246 J	0.15 U	0.15 U	0.075 U	0.11 J	0.073 U	0.072 U	0.17 U					
Perfluorooctane sulfonate (PFOS)	2	300	4,000	4.5	2.7	1.1	0.29 J	4.4	1.1	1.0	1.1	0.26 U	0.26 U	0.29 J	0.26 U	0.26 U	0.257 U	0.26 U	0.38 J	0.26 U	0.85 J	0.26 U	0.26 U	<2.0	1.3	<1.9	0.32 J	<2.0	0.29 J	2.02	0.573 J	1.15	0.611 J	0.259 U	0.26 U	0.276 J	0.559 J	0.0127 U	0.0124 U	0.40 J					
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	4.4	1.2	0.62 J	0.13 U	1.6	0.28 U	0.85 J	0.13 U	0.28 U	0.28 U	0.42 J	0.28 U	1.4	0.133 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	0.28 U	<2.0	0.34 J	<1.9	0.95 J	<2.0	0.15 U	0.074 J	0.147 J	0.146 J	0.066 U	0.134 U	0.134 U	0.067 U	0.119 J	0.065 U	0.064 U	0.63 J					
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	0.93 J	0.74 J	1	0.23 U	0.61 J	4.2	0.65 J	2.2	0.26 U	0.26 U	0.26 U	0.26 U	18	0.355 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	<2.0	0.173 U	<1.9	0.25 U	<2.0	0.22 U	0.17 U	0.172 U	0.161 U	0.175 U	0.358 U	0.359 U	0.179 U	0.164 U	0.221 J	0.172 U	0.39 J					
Total PFAS	NA	NA	NA	120.06	41.75	46.85	1.16	23.72	11.03	11.9	95.43	0	0	6.2	1.14	161.07	0.613	1.5	1.35	0.48	1.92	1.1	0.43	0	0	0	5.2	0	13.15	0.0	0.45	3.131	11.267	2.652	1.409	0.316	0.147	0.571	1.412	0.411	0.09	11.14			
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	12.97	14	4.53	0.49	8.93	6.42	6.47	2.6	0	0	1.97	0.3	5.27	0.228	0	0.38	0	1.19	0.33	0	0	0	3.916	0	3	0	0.29	2.453	3.553	1.764	1.087	0.196	0.147	0.276	0.953	0.089	0.046	1.33				
Sample Location			Deployment Area																																										
Sample ID	Method 1 Standard	UCL	DL2 (0-1')	DL2 2'	DL2 4'	DL3 (0-1')	DL3 2'	DL3 4'	DL4 (0-1')	DL4 2'	DL4 4'	DL5 (0-1')	DL5 2'	DL5 4'	DL6 (0-1')	DL7 (0-1')	DL8 (2')	DL8 (4')	DL9 (0-1')	DL10 (0-1')	DL11 (0-1')	DL11 (0-1')	DL11 (4-6')	DL11 (10-12')	DL11 (14-16')	DL12 (0-1')	DL13 (0-1')	DL14 (0-1')	DL14 (4-6')	DL14 (10-12')	DL14 (14-16')	DL15 (0-1)	DL16 (0-1)	DL17 (0-1)	DL18 (0-1)	DL19 (0-1)	DL20 (0-1)	DL21 (0-1)	DL22 (2-4)	DL22 (6-8)					
Sample Date	S-1/GW-1	S-1/GW-3	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	6/20/2017	9/26/2017	9/26/2017	6/20/2017	6/20/2017	8/20/2019	10/4/2018	10/4/2018	10/4/2018	9/26/2017	9/26/2017	9/26/2017	10/4/2018	10/4/2018	10/4/2018	9/30/2020	9/30/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020	9/25/2020				
Perfluorheptanoic acid (PFHpA)	0.5	300	4,000	1.9	1.2	0.48 J	0.84 J	0.17 U	0.31 J	0.17 U	0.17 U	2.5	0.40 J	0.50 J	5.0	2.5 J	2.9 J	4.7 J	0.66 J	1.3	2.1	1.8	1.3	0.31 J	0.23 J	1.2	1.6	4.9	0.36 J	0.19 U	1.4	0.175 U	0.138 J	0.167 U	0.319 J	0.145 U	0.157 U	0.158 U	0.109 J	0.481 J					
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	1.8	1.3	0.59 J	0.34 J	0.23 U	0.23 U	0.23 U	0.23 U	0.25 U	0.25 U	0.49 J	0.49 J	0.23 U	0.23 U	2.3 U	2.3 U	0.35 J	0.94 J	0.82 J	<0.9	0.24 U	0.24 U	0.23 U	0.23 U	0.23 U	0.24 U	0.24 U	0.24 U	0.24 U	0.159 J	0.194 J	0.21 U	0.212 U	0.057 U	0.071 J							
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	1.6	4.1	0.74 J	0.85 J	0.26 U	0.26 U	0.83 J	0.26 U	3.7	1.6	0.26 U	0.26 U	4.2 J	25	22	0.68 J	1.7	4.7	5.2	2.9	1.9	0.50 J	4.6	2.4	23	0.58 J	0.32 J	2.9	0.334 J	0.233 J	0.166 J	0.979 J	0.135 U	0.146 U	0.159 J	0.447 J	1.32					
Perfluorononanoic acid (PFNA)	0.32	300	4,000	0.81 J	2.5	0.17 U	0.17 U	0.17 U	2.7	0.17 U	3.7	0.19 J	0.17 U	0.17 U	0.19 J	9.6 J	46	17	0.38 J	16	2.4	2.5	0.22 U	0.22 U	7.3	1.5	10	0.292 U	0.285 J	0.277 U	0.296 J	0.241 U	0.261 U	0.263 U	5.46	2.66									
Perfluorooctane sulfonate (PFOS)	2	300	4,000	12	1.5	0.21 U	0.51 J	0.21 U	0.21 U	2.0	0.21 U	0.50 J	0.21 U	0.21 U	0.21 U	3.9 J	14	2.1 U	0.38 J	29	1.5	0.26 U	0.38 J	23	0.66 J	7.6	0.26 U	0.26 U	2.3	0.505 U	0.575 J	0.481 U	1.05 J	0.418 U	0.452 U	0.456 U	20.3	8.85							
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	0.13 U	0.13 U	0.13 U	1.4	0.13 U	1.3	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	1.3 U	1.3 U	1.3 U	0.13 U	1.8	8.7	0.28 U	0.28 U	0.28 U	0.28 U	0.66 J	7.4	9.6	0.28 U	0.28 U	0.28 U	0.181 J	0.248 U	0.167 J	0.215 U	0.233 U	0.235 U	0.834 J	0.383 J							
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	0.23 U	0.23 U	0.57 J	3.1	1.5	1	0.24 J	0.23 U	1.7	0.23 U	0.23 U	0.23 U	2	290	1600	900	0.23 U	0.23 U	7.8	30	4.4	6.7	62	320	230	0.67 J	0.30 J	64	0.698 U	0.168 U	0.664 U	0.19 U	0.577 U	0.625 U	0.629 U	7.49	11.7					
Total PFAS	NA	NA	NA	24.41	12.17	2.38	84.86	9.56	13.81	9.6	0.88	5.9	11.03	2.49	0.5	18.59	404.4	1727.2	949.6	6.38	9.1	85.22	91.5	11.07	6.82	7.63	108.56	521.26	598.24	50.11	21.22	116.64	4.523	2.269	0.628	4.84	0	0	0.68	66.813	41.988				
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	18.11	10.6	1.81	4.44	0	0	7.14	0	4.2	6.88	2.49	0.5	5.19	20.2	87.9	26.7	2.29	4.2	54.42	19.6	6.7	2.21	0.73	36.76	13.56	55.81	0.94	0.32	17.34	0.334	1.402	0.166	2.97	0	0	0.159	27.15	13.764				
Sample Location			Deployment Area																									Annual Deployment (0-1)																	
Sample ID	Method 1 Standard	UCL	DL22 (18-20)	DL23 (0-1)	D1 (0-1')	D2 (0-1)	D3 (0-1')	D4 (0-1')	D5 (0-1')	D6 (0-1)	D7 (0-1)	D8 (0-1)	D9 (0-1)	D10 (0-1)	D11 (0-1)	D12 (0-1)	HW-F (10-12)	HW-F (14-16')	HW-3 (0-1')	MCI Drill (0-1)	Annual Deployment (0-1)																								
Sample Date	S-1/GW-1	S-1/GW-3	9/25/2020	9/29/2020	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	8/14/2018	10/4/2018	10/4/2018	10/9/2018	12/9/2016	12/9/2016																								
Perfluorheptanoic acid (PFHpA)	0.5	300	4,000	0.073 J	0.24 J	0.19 U	0.21 J	0.19 U	0.95 J	0.22 J	0.25 J	7.8	1.0	2.7	0.19 U	0.19 U	0.19 U	0.32 J	1.3	0.19 U	8.4	20																							
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	0.059 U	0.134 J	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.31 J	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.5 J	4 U																							
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	0.176 J	0.471 J	0.25 U	0.33 J	0.25 U	1.1	0.25 U	0.28 J	14	2.2	3	0.25 U	0.25 U	0.25 U	1.4	0.25 U	23	100																								
Perfluorononanoic acid (PFNA)	0.32	300	4,000	0.476 J	0.176 J	0.22 U	0.67 J	0.22 U	0.98 J	0.22 U	0.22 U	10	0.59 J	0.83 J	0.22 U	0.32 J	0.22 U	0.22 U	14	31																									
Perfluorooctane sulfonate (PFOS)	2	300	4,000	1.18	0.725 J	0.26 U	0.66 J	0.38 J	2.9	0.26 U	0.26 U	3.4	2.1	0.67 J	0.54 J	0.91 J	0.44 J	0.26 U	0.26 U	24	1.9 J																								
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	0.065 U	0.266 J	0.28 U	0.28 U	0.28																																					

Table 2. Groundwater Results for PFAS ug/L

[illegible]

Notes:

- UCL = Upper Concentration Limit
- < = Not detected by the laboratory above the reporting limit. Reporting limit shown.
- J = Estimated concentration between the method detection limit and reporting limit.
- Results in $\mu\text{g/L}$, micrograms per liter.
- ND = Not detected by the Laboratory above the method detection limit. Method detection limit shown.
- Bold results above Method 1 & GW 1 standard (0.02 $\mu\text{g/L}$).
- Sum of six includes estimated values and does not include non-detects (I or J).
- Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include ND.
- NA = Not Applicable.
- * = ME-1 is screened from 37 to 47 and 70 to 80 feet below grade.
- ** = ME-2 is screened from 44 to 54 feet below grade.
- *** = ME-3 is screened from 50 to 60 feet below grade.

The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 $\mu\text{g/L}$.

1. Well elevation increased due to soil cap.

Table 3 - 1,4 Dioxane Results in Groundwater ug/L

Sample Location	North Ramp																	Airport Road/Iyannough Road Area								ARFF Building			
Sample ID	HW-1	HW-1	HW-5	HW-12	OW-6	OW-6	HW-4M	HW-4D	HW-204	HW-29	HW-207S	HW-207D	HW-207D	HW-19D	HW-19D	HW-X(s)	HW-X(m)	HW-A(D)	HW-A(D)	HW-B(D)	HW-N	HW-O	HW-U(d)	HW-V(m)	HW-L(s)	HW-L(m)	HW-L(d)	HW-L(d)	
Sample Date	5/7/2015	8/5/2019	5/7/2015	5/7/2015	5/7/2015	9/27/2019	4/5/2017	4/5/2017	9/27/2019	9/27/2019	9/27/2019	4/5/2017	9/27/2019	4/5/2017	9/27/2019	9/10/2021	9/10/2021	4/5/2017	8/5/2019	4/5/2017	8/5/2019	8/5/2019	10/2/2020	10/2/2020	10/7/2020	10/7/2020	7/2/2019	5/13/2020	
1,4-Dioxane	<0.152	<0.25	<0.150	<0.150	<0.150	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.19	<0.22	<0.25	<0.25	<0.25	<0.25	<0.25	0.73	0.8	<0.2	<0.2	0.727	0.75	
Sample Location	Maher Well Field																Deployment Area												
Sample ID	OW-9M	OW-9D	OW-9D	OW-9D	OW-9DD	OW-9DD	OW-9DD	OW-18M	OW-18D	OW-18D	OW-18D	OW-19M	OW-19D	OW-19D	OW-19D	HW-E	HW-J												
Sample Date	5/28/2015	5/28/2015	12/3/2018	5/5/2020	5/28/2015	4/11/2017	12/3/2018	4/11/2017	4/11/2017	12/7/2018	5/13/2020	4/11/2017	4/11/2017	12/7/2018	5/13/2020	9/10/2021	9/10/2021												
1,4-Dioxane	<0.141	<0.141	<0.25	<0.19	0.926	0.838	0.732	<0.25	0.552	<0.25	0.35	<0.25	0.800	<0.25	0.3	<0.20	<0.20												

Notes:
Results in ug/L, micrograms per liter.
< = Not detected by the laboratory above the reporting limit. Reporting limit shown.
Bold results above Method 1 GW-1 standard (0.3 ug/L).
The Method 1 GW-2 standard for 1,4-dioxane is 6,000 ug/l.
The Method 1 GW-3 standard for 1,4-dioxane is 50,000 ug/l.

Table 4. ARFF Concentrate Analytical Results ug/L

Sample ID	Foam Mix
Sample Date	12/9/2016
Perfluoroheptanoic acid (PFHpA)	3.4 J
Perfluorohexanesulfonic acid (PFHxS)	2.1 J
Perfluorononanoic acid (PFNA)	93
Perfluorooctanoic acid (PFOA)	19
Perfluorooctane sulfonate (PFOS)	5 U
Perfluorodecanoic Acid (PFDA)	2.8 J
6:2 FTS	33
Total PFAS	222.5
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	120.3

Notes:

1. U = Not detected by the laboratory above the Method Detection Limit. Method Detection Limit shown.
2. Results in ug/L, micrograms per liter.
3. Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U).
4. Sample is AFFF concentrate.
5. J = Estimated concentration between the Method Detection Limit and the Laboratory Reporting Limit.

Table 5. SPLP Results ug/L

Sample ID	DL4 4'	DL5 2'	DL8 (4')	DL14(0-1')	Stockpile West	Stockpile East	ARFF Rubber Roof	ARFF Asphalt Roof
Sample Date	9/26/2017	9/26/2017	9/26/2017	9/26/2017	10/10/2017	10/10/2017	11/17/2020	11/17/2020
Perfluoroheptanoic acid (PFHpA)	0.011 U	0.011 U	0.065 J	0.17	0.011 U	0.011 U	0.00279	0.0002 U
Perfluorohexanesulfonic acid (PFHxS)	0.0072 U	0.0072 U	0.036 U	0.01 J	0.0072 U	0.0072 U	0.00034 U	0.00036 U
Perfluorononanoic acid (PFNA)	0.16	0.0032 U	0.052 J	0.37	0.0032 U	0.0032 U	0.00068 J	0.00028 U
Perfluorooctanoic acid (PFOA)	0.012 J	0.042	0.6	0.87	0.0037 U	0.0037 U	0.0073	0.00021 U
Perfluorooctane sulfonate (PFOS)	0.013 J	0.0072 U	0.036 U	0.19	0.0072 U	0.0072 U	0.00045 U	0.00202
Perfluorodecanoic Acid (PFDA)	0.0052 U	0.0052 U	0.026 U	0.34	0.0052 U	0.0052 U	0.000364 J	0.000271 U
6:2 FTS	0.067	0.0072 U	25	7.13	0.034 J	0.024 J	0.0154 J	0.0017 J
Total PFAS	0.195	0.042	26.25	20.195	0.034	0.024	0.072723	0.07957
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.185	0.042	0.717	1.95	0.011 U	0.011 U	0.011133	0.00202

Notes:

1. U = Not detected by the laboratory above the Method Detection Limit. Method Detection Limit shown.
2. Results in ug/L, micrograms per liter.
3. Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U).

Table 6: Background PFAS Levels in Soil

Background Sample Locations																									
Sample ID	Method 1 Standard		Stockpile West	Stockpile East	Loam Pile	BG-1 0-1'	BG-2 0-1'	BG-3 0-1'	BG-4 0-1'	BG-5 0-1'	BG-6 0-1'	BG-7 0-1'	BG-8 0-1'	BG-9 0-1'	BG-10 0-1'	BG-11 0-1'	BG-12 0-1'	BG-13 0-1'	BG-14 0-1'	BG-15 0-1'	BG-16 0-1'	BG-17 0-1'	BG-18 0-1'	BG-19 0-1'	BG-20 0-1'
Sample Date	S-1/GW-1	S-1/GW-3	10/10/2017	10/10/2017	10/10/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	10/26/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017	12/14/2017
Sample Location			On-Airport	On-Airport	On-Airport	Off-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	On-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport	Off-Airport
Perfluoroheptanoic acid (PFHpA)	0.5	300	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.18 J	0.17 U	0.18 J	0.17 U	0.17 U	0.23 J	0.17 U	0.17 U	0.19 U	0.19 U	0.19 U	0.19 U	0.44 J	0.19 U	0.19 U	0.35 J	0.19 U	0.46 J
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.24 U	0.39 J	0.24 U	0.24 U	0.57 J	0.47 J	0.24 U	0.49 J	0.24 U	0.24 U
Perfluorooctanoic acid (PFOA)	0.72	300	0.26 U	0.26 U	0.26 U	0.58 J	0.26 U	0.26 U	0.16 U	0.47 J	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.75 J	0.67 J	0.33 J	0.25 U	0.46 J	0.37 J	0.36 J	0.5 J	0.25 U	0.86 J
Perfluorononanoic acid (PFNA)	0.32	300	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.17 U	0.22 U	0.29 J	0.22 U	0.22 U	0.53 J	0.22	0.67 J	0.41 J	0.22 U	0.22 U
Perfluorooctane sulfonate (PFOS)	2	300	0.38 J	0.39 J	0.81 J	0.21 U	0.7 J	0.38 J	2.3	0.41 J	0.32 J	0.33 J	0.31 J	1.3	0.62 J	0.41 J	0.76 J	0.99	0.26 U	3.1	2	0.36 J	2.3	0.41 J	0.44 J
Perfluorodecanoic Acid (PFDA)	0.3	300	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.28 U	0.28 U	0.36 J	0.28 U	0.31 J	0.41 J	0.28 U	0.41 J	0.28 U	0.28 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six																									
Total PFAS	NA	NA	1.78	0.91	0.81	1.47	0.7	0.56	3.21	1.31	0.32	0.3	0.84	1.3	0.62	1.16	2.73	1.68	0	6.79	3.77	5.09	5.45	0.41	2.43
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	0.38	0.39	0.81	0.58	0.7	0.56	2.3	1.06	0.32	0.33	0.54	1.3	0.62	1.16	2.11	1.68	0	5.41	3.47	1.39	4.46	0.41	1.76

Notes:

J = Estimated concentration between the method detection limit and reporting limit.

Results in ug/kg, micrograms per kilogram.

U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.

Bold results above the proposed Method 1 S-1/GW-1 standard.

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Sum of six includes estimated values and does not include non-detects (U or <).

Table 7. Surface Water Results for PFAS ug/L

	Surface Water		
Sample ID	Kmart	LP-1	UGP-1
Sample Date	6/20/2017	7/11/19	7/11/19
Perfluoroheptanoic acid (PFHpA)	0.0033 U	<0.01	<0.02
Perfluorohexanesulfonic acid (PFHxS)	0.0034 U	<0.01	<0.02
Perfluorononanoic acid (PFNA)	0.0043 J	<0.01	<0.02
Perfluorooctanoic acid (PFOA)	0.0026 U	<0.01	<0.02
Perfluorooctane sulfonate (PFOS)	0.0046 U	<0.01	<0.02
Perfluorodecanoic Acid (PFDA)	0.0040 U	<0.01	<0.02
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six			
Total PFAS	0.0174	0.018	0.047
Sum of Six (PFHpA, PFHxS, PFOA, PFOS, PFNA, and PFDA)	0.0043	<0.01	<0.02

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.

J = Estimated concentration between the method detection limit and reporting limit.

Results in ug/L, micrograms per liter.

U= Not detected by the laboratory above the method detection limit. Method detection limit shown.

Sum of six includes estimated values and does not include non-detects (U or <).

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Currently MassDEP has not issued a surface water standard for PFAS.

The Method 1 GW-1 Standard for the Sum of Six is 0.02 ug/l.

The Method 1 GW-3 Standard for the individual analytes in the Sum of Six range from 500 to 40,000 ug/l.

Table 8: Ratio of Stable Isotopes Oxygen-18 and Hydrogen-2 Laboratory Results

Sample Date	Lab Sample ID	HW Sample ID	Stable Isotope Oxygen-18			Stable Isotope Hydrogen-2		
			δ18O (V-SMOW)	Atm %	Expected Values	δ18O (V-SMOW)	Atm %	Expected Values
11/7/2018	1811299-2	HW-I	-6.92	0.20	-	-40.41	0.01494	-
			-6.77	0.20	-	-40.17	0.01495	-
	1811299-4	HW-E	-6.79	0.20	-	-38.56	0.01497	-
			-6.85	0.20	-	-38.87	0.01497	-
	1811299-5	HW-F	-6.9	0.20	-	-38.28	0.01498	-
			-6.88	0.20	-	-38.15	0.01498	-
	1811299-7	SW-2	-2.67	0.20	-	-18.65	0.01528	-
			-2.61	0.20	-	-20.42	0.01526	-
						-23.04	0.01521	-
12/3/2018	1812198-1	HW-G(S)	-6.74	0.20	-	-38.19	0.01498	-
			-6.93	0.20	-	-37.87	0.01498	-
	1812198-2	HW-G(M)	-7.53	0.20	-	-44.34	0.01498	-
			-7.57	0.20	-	-44.39	0.01498	-
	1812198-3	HW-G(D)	-7.18	0.20	-	-44.15	0.01489	-
			-7.45	0.20	-	-44.56	0.01488	-
	1812198-4	OW-9S	-7.29	0.20	-	-41.86	0.01492	-
			-7.41	0.20	-	-42.94	0.0149	-
	1812198-5	OW-9D	-7.76	0.20	-	-47.91	0.01483	-
			-7.71	0.20	-	-46.82	0.01484	-
					-	-47.20	0.01484	-
			1812198-6	OW-9DD	-7.52	0.20	-	-45.58
	-7.57	0.20			-	-45.48	0.01487	-
	1812198-7	OW-9M	-7.13	0.20	-	-41.44	0.01493	-
			-7.24	0.20	-	-43.40	0.0149	-
-7.58						0.20	-	-49.29
12/7/2018	1812232-1	OW-18S	-7.54	0.20	-	-49.66	0.0148	-
			-6.95	0.20	-	-42.64	0.01491	-
	1812232-2	OW-18M	-6.89	0.20	-	-42.57	0.01491	-
			-7.28	0.20	-	-44.76	0.01488	*
	1812232-3	OW-18D	-7.36	0.20	-	-41.61	0.01493	*
			IAEA OH-14	-	-5.64	0.20	-5.6	-37.45
QA/QC	IAEA OH-15	-	-9.59	0.20	-9.41	-77.89	0.01436	-78
	IAEA OH-16	-	-15.72	0.20	-15.41	-	-	-113.8
	Antarc IC	-	-29.83	0.19	-30	-	-	-239.69

Table 9. Fire Truck Spray Water Analytical Results ug/L

Sample ID	Fire Truck Spray Water Spray											
	Hose		Roof		Bumper		Officer Side Handline		Driver side-Rear		Officer side-Rear	
Sample Date	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019	8/22/2019	11/12/2019
Perfluoroheptanoic acid (PFHpA)	0.073	<0.002	0.0045	<0.002	0.0039	<0.002	0.027	<0.002	0.0055	<0.002	0.081	0.0021
Perfluorohexanesulfonic acid (PFHxS)	0.0059	<0.002	0.0033	<0.002	0.0039	<0.002	0.004	<0.002	0.0048	<0.002	0.0043	<0.002
Perfluorononanoic acid (PFNA)	0.011	<0.002	0.0026	<0.002	0.0031	<0.002	0.013	<0.002	0.003	<0.002	0.016	<0.002
Perfluorooctanoic acid (PFOA)	0.088	0.0062	0.0087	<0.002	0.01	<0.002	0.039	<0.002	0.011	<0.002	0.076	0.0041
Perfluorooctane sulfonate (PFOS)	0.009	0.0021	0.0068	<0.002	0.006	<0.002	0.0087	<0.002	0.0093	<0.002	0.0086	<0.002
Perfluorodecanoic Acid (PFDA)	0.014	<0.002	0.004	<0.002	0.0045	<0.002	0.032	<0.002	0.0049	<0.002	0.032	<0.002
Total PFAS	5.7017	0.3391	0.9195	0.0205	0.7817	0.0167	4.1098	0.0481	0.8302	0.0087	5.4701	0.086
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.2009	0.0083	0.0299	<0.002	0.0314	<0.002	0.1237	<0.002	0.0385	<0.002	0.2179	0.0041

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.

Results in ug/L, micrograms per liter.

Bold results above proposed MassDEP GW-1 standard (0.02 ug/L)

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Table 10: Total Organic Carbon Data (mg/kg)

Total Organic Carbon Concentration																	
Sample ID	HW-W dd 3-5 ft	HW-W dd 8-10 ft	HW-W dd 18-20 ft	HW-W dd 23-25 ft	HW-W dd 28-30 ft	HW-W dd 33-35 ft	HW-W dd 38-40 ft	HW-W dd 43-45 ft	HW-W dd 48-50 ft	HW-W dd 58-60 ft	HW-W dd 63-65 ft	S1 0-2ft	S1 2-4ft	S1 4-6ft	S2 0-2ft	S2 2-4ft	S2 4-6ft
Sample Date	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	04/06/2021	4/19/2021	4/19/2021	4/19/2021	4/19/2021	4/19/2021	4/19/2021
Sample Depth (ft below grade)	3-5	8-10	18-20	23-25	28-30	33-35	38-40	43-45	48-50	58-60	63-65	0-2	2-4	4-6	0-2	2-4	4-6
Sample Location	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Water Department Property	Deployment Area	Deployment Area	Deployment Area	Deployment Area	Deployment Area	Deployment Area
Total Organic Carbon	94.8 U	94.3 U	96.5 U	93.9 U	95.7 U	93.5 U	96.9 U	95.7 U	95.7 U	95.7 U	95.7 U	28,900	1,150	180	1,550	95.1 U	3,500

Notes:
Results in mg/kg, milligrams per kilogram.
U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.

Table 11.Runway 6/24 Surface Sample Results ug/kg

Sample Location				Surface Soils					
Sample ID	Method 1 Standard		UCL	6-24 A (0-1)	6-24 A (1-2)	6-24 B (0-1)	6-24 B (1-2)	6-24 C (0-1)	6-24 C (1-2)
Sample Date	S-1/GW-1	S-1/GW-3		3/2/2022	3/2/2022	3/2/2022	3/2/2022	3/4/2022	3/4/2022
Perfluoroheptanoic acid (PFHpA)	0.5	300	4,000	<0.051	<0.046	0.068 J	<0.049	<0.055	0.079 J
Perfluorohexanesulfonic acid (PFHxS)	0.3	300	4,000	<0.068	<0.062	<0.064	<0.066	<0.074	<0.069
Perfluorooctanoic acid (PFOA)	0.72	300	4,000	<0.047	0.115 J	0.136 J	0.106 J	0.058 J	0.156 J
Perfluorononanoic acid (PFNA)	0.32	300	4,000	<0.085	<0.077	0.115 J	<0.082	<0.091	<0.085
Perfluorooctane sulfonate (PFOS)	2	300	4,000	0.318	0.361	0.471	0.196 J	0.654	0.297
Perfluorodecanoic Acid (PFDA)	0.3	300	4,000	<0.076	<0.069	<0.071	<0.073	<0.082	<0.076
6:2 Fluorotelomer sulfonate (6:2 FTS)	NA	NA	NA	<0.203	<0.184	<0.19	<0.197	<0.219	<0.203
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six									
Total PFAS	NA	NA	NA	0.457	0.731	1.312	0.55	1.123	0.85
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	NA	NA	NA	0.318	0.476	0.79	0.302	0.712	0.532

Notes:

< = Not detected by the laboratory above the reporting limit. Reporting limit shown.

J = Estimated concentration between the method detection limit and reporting limit.

Results in ug/kg, micrograms per kilogram.

U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.

Bold results above the Method 1 S-1/GW-1 standard.

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

Sum of six includes estimated values and does not include non-detects (U or <).

UCL = Upper Concentration Limit

Sample depth in feet below grade in parenthesis

Table 12. Select Pre and Post Cap Groundwater Results for PFAS Compounds (ug/L)

Sample Location	ARFFF/SRE Area			Deployment Area Area					
Sample ID	HW-P (s)			HW-I (s)			HW-E		
Sample Type	Pre-Cap	Post-Cap	Post-Cap	Pre-Cap	Post-Cap	Post-Cap	Pre-Cap	Post-Cap	Post-Cap
Sample Date	10/1/2020	3/18/2021	9/8/2021	5/8/2020	3/17/2021	9/8/2021	5/5/2020	3/17/2021	9/8/2021
Perfluoroheptanoic acid (PFHpA)	0.026	0.0067	0.004	0.54	0.032	0.097	0.044	0.014	0.0018 J
Perfluorohexanesulfonic acid (PFHxS)	0.0018 J	0.00074 J	0.00056 J	0.22	0.021	0.036	0.011	0.0015 J	0.00088 J
Perfluorononanoic acid (PFNA)	0.0061	0.002	0.0013 J	0.082	0.065	0.033	0.0052	0.00048 U	0.00037 U
Perfluorooctanoic acid (PFOA)	0.0084	0.0042	0.0017 J	0.29	0.05	0.063	0.027	0.00095 J	0.00094 J
Perfluorooctane sulfonate (PFOS)	0.00097	0.00049 J	0.00054 U	0.04	0.028	0.02	0.0037	0.00082 J	0.00064 U
Perfluorodecanoic Acid (PFDA)	0.00085	0.0004 J	0.00048 U	<0.002	0.0038 U	0.00047 U	<0.002	0.00038 U	0.00052 U
6:2 Fluorotelomer sulfonate (6:2 FTS)	0.011	0.0034	0.0014 J	13	1.7	2.1	0.86	0.0035	0.00039 U
Sum of Laboratory Reported PFAS (Total PFAS) and Sum of Six									
Total PFAS	0.2478	0.06294	0.05055	15.5383	2.082	2.73304	1.04526	0.04812	0.01342
Sum of Six (PFHpA,PFHxS,PFOA, PFOS, PFNA, and PFDA)	0.04412	0.01453	0.00756	1.172	0.196	0.249	0.0909	0.01727	0.00362
Statistics									
Percent Total PFAS Decrease	-79.60%			-82.41%			-98.72%		
Percent Sum of 6 Decrease	-82.86%			-78.75%			-96.02%		

Results in ug/L, micrograms per liter.

U= Not detected by the Laboratory above the method detection limit. Method detection limit shown.

Bold results above Method 1 GW-1 standard (0.02 ug/L).

Sum of six includes estimated values and does not include non-detects (U or <).

Total PFAS is the sum of all laboratory detected PFAS analytes including estimated values and does not include non-detects (U or <).

The Method 1 GW-3 Standard for the individual analytes in the Sum of Six ranges from 500 to 40,000 ug/l.

Percent increase or decrease is calculated as follows: $[(\text{Post Cap} - \text{Pre Cap}) / (\text{Pre Cap})] * 100$

APPENDIX A

Laboratory Analysis Report



ANALYTICAL REPORT

Lab Number:	L2211112
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	HYA
Project Number:	Not Specified
Report Date:	03/14/22

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2211112-01	6-24 A (0-1)	SOIL	HYANNIS, MA	03/02/22 09:55	03/03/22
L2211112-02	6-24 A (1-2)	SOIL	HYANNIS, MA	03/02/22 09:55	03/03/22
L2211112-03	6-24 B (0-1)	SOIL	HYANNIS, MA	03/02/22 12:15	03/03/22
L2211112-04	6-24 B (1-2)	SOIL	HYANNIS, MA	03/02/22 12:15	03/03/22

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES

A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	YES
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	YES
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES

For any questions answered "No", please refer to the case narrative section on the following page(s).
--

Please note that sample matrix information is located in the Sample Results section of this report.



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Report Submission

All MCP required questions were answered with affirmative responses; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2211112-01R: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

L2211112-02, -03, and -04: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

WG1614223-1R, WG1614223-2R, and WG1614223-3R: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

WG1614223-4: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 03/14/22

QC OUTLIER SUMMARY REPORT

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab								
LCMSMS-ID	6-24 A (1-2)	L2211112-02	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	19	31-134	-	- - not applicable - -
LCMSMS-ID	6-24 A (1-2)	L2211112-02	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	27	34-137	-	- - not applicable - -
LCMSMS-ID	6-24 B (0-1)	L2211112-03	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	24	31-134	-	- - not applicable - -
LCMSMS-ID	6-24 B (0-1)	L2211112-03	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	26	34-137	-	- - not applicable - -
LCMSMS-ID	6-24 B (1-2)	L2211112-04	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	7	31-134	-	- - not applicable - -
LCMSMS-ID	6-24 B (1-2)	L2211112-04	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	9	34-137	-	- - not applicable - -
LCMSMS-ID	Batch QC (L2211112-02)	WG1614223-4	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	18	31-134	-	- - not applicable - -
LCMSMS-ID	Batch QC (L2211112-02)	WG1614223-4	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	20	34-137	-	- - not applicable - -

ORGANICS

SEMIVOLATILES

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-01 R
Client ID: 6-24 A (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/12/22 09:36
Analyst: RS
Percent Solids: 86%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.084	J	ng/g	0.564	0.026	1
Perfluoropentanoic Acid (PFPeA)	0.055	J	ng/g	0.564	0.052	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.282	0.044	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.13	0.073	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.564	0.059	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.13	0.094	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.282	0.051	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.282	0.068	1
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.282	0.047	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.564	0.203	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.564	0.154	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.282	0.085	1
Perfluorooctanesulfonic Acid (PFOS)	0.318		ng/g	0.282	0.147	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.282	0.076	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.564	0.324	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.13	0.338	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.564	0.228	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.564	0.053	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.564	0.173	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.564	0.111	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.564	0.095	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.564	0.079	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.564	0.231	1
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.564	0.061	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-01 R
Client ID: 6-24 A (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	96		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	99		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	58		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	91		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	93		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	108		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	105		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	69		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	107		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	102		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	86		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	47		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	110		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	72		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	60		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	104		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	103		24-159

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-02
Client ID: 6-24 A (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/11/22 01:38
Analyst: HT
Percent Solids: 89%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.057	J	ng/g	0.514	0.023	1
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	0.514	0.047	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.257	0.040	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.03	0.066	1
Perfluorohexanoic Acid (PFHxA)	0.068	J	ng/g	0.514	0.054	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.03	0.086	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.257	0.046	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.257	0.062	1
Perfluorooctanoic Acid (PFOA)	0.115	J	ng/g	0.257	0.043	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.514	0.184	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.514	0.140	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.257	0.077	1
Perfluorooctanesulfonic Acid (PFOS)	0.361		ng/g	0.257	0.134	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.257	0.069	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.514	0.295	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.03	0.307	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.514	0.207	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.514	0.048	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.514	0.157	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.514	0.101	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.514	0.087	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.514	0.072	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.514	0.210	1
Perfluorotetradecanoic Acid (PFTA)	0.130	J	ng/g	0.514	0.056	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-02
Client ID: 6-24 A (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Surrogate (Extracted Internal Standard)	% Recovery			Qualifier	Acceptance Criteria	
Perfluoro[13C4]Butanoic Acid (MPFBA)	86				61-135	
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	93				58-150	
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	96				74-139	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	63				14-167	
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	97				66-128	
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	87				71-129	
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	105				78-139	
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93				75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	69				20-154	
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	125				72-140	
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	101				79-136	
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	96				75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	75				19-175	
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	19			Q	31-134	
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96				61-155	
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	80				10-117	
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	27			Q	34-137	
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	91				54-150	
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	89				24-159	

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-03
Client ID: 6-24 B (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/11/22 02:11
Analyst: HT
Percent Solids: 88%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.133	J	ng/g	0.530	0.024	1
Perfluoropentanoic Acid (PFPeA)	0.108	J	ng/g	0.530	0.049	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.265	0.041	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.06	0.068	1
Perfluorohexanoic Acid (PFHxA)	0.069	JF	ng/g	0.530	0.056	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.06	0.089	1
Perfluoroheptanoic Acid (PFHpA)	0.068	J	ng/g	0.265	0.048	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.265	0.064	1
Perfluorooctanoic Acid (PFOA)	0.136	J	ng/g	0.265	0.044	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.530	0.190	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.530	0.145	1
Perfluorononanoic Acid (PFNA)	0.115	J	ng/g	0.265	0.079	1
Perfluorooctanesulfonic Acid (PFOS)	0.471	F	ng/g	0.265	0.138	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.265	0.071	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.530	0.304	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.06	0.317	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.530	0.213	1
Perfluoroundecanoic Acid (PFUnA)	0.072	J	ng/g	0.530	0.050	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.530	0.162	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.530	0.104	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.530	0.090	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.530	0.074	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.530	0.217	1
Perfluorotetradecanoic Acid (PFTA)	0.140	J	ng/g	0.530	0.057	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-03
Client ID: 6-24 B (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Surrogate (Extracted Internal Standard)	% Recovery		Qualifier	Acceptance Criteria		
Perfluoro[13C4]Butanoic Acid (MPFBA)	88			61-135		
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	93			58-150		
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98			74-139		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	64			14-167		
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	99			66-128		
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	85			71-129		
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	102			78-139		
Perfluoro[13C8]Octanoic Acid (M8PFOA)	92			75-130		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	73			20-154		
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	124			72-140		
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	102			79-136		
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	97			75-130		
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	71			19-175		
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	24		Q	31-134		
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	99			61-155		
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	77			10-117		
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	26		Q	34-137		
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	97			54-150		
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	88			24-159		

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-04
Client ID: 6-24 B (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/11/22 02:28
Analyst: HT
Percent Solids: 85%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.066	J	ng/g	0.548	0.025	1
Perfluoropentanoic Acid (PFPeA)	0.069	J	ng/g	0.548	0.050	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.274	0.043	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.10	0.071	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.548	0.058	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.10	0.092	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.274	0.049	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.274	0.066	1
Perfluorooctanoic Acid (PFOA)	0.106	J	ng/g	0.274	0.046	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.548	0.197	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.548	0.150	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.274	0.082	1
Perfluorooctanesulfonic Acid (PFOS)	0.196	J	ng/g	0.274	0.142	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.274	0.073	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.548	0.314	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.10	0.328	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.548	0.221	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.548	0.051	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.548	0.168	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.548	0.107	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.548	0.093	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.548	0.077	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.548	0.224	1
Perfluorotetradecanoic Acid (PFTA)	0.113	J	ng/g	0.548	0.059	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-04
Client ID: 6-24 B (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						

Surrogate (Extracted Internal Standard)	% Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	74		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	80		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	89		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	53		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	85		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	76		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	96		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	81		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	62		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	107		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	92		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	85		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	63		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	7	Q	31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	86		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	81		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	9	Q	34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	83		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	77		24-159

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Method Blank Analysis Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/12/22 09:02
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-04 Batch: WG1614223-1 R					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	0.500	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	0.500	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.250	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.500	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.250	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.250	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.250	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.500	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.500	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.250	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	0.250	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.250	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.500	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.500	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.500	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.500	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.500	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.500	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.500	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.500	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.500	0.054

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Method Blank Analysis Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/12/22 09:02
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-04 Batch: WG1614223-1 R					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	101		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	104		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	54		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	96		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	110		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	107		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	64		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	103		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	105		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	104		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	66		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	77		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	113		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	82		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	85		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	100		24-159

Lab Control Sample Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 Batch: WG1614223-2								
Perfluorobutanoic Acid (PFBA)	86		-		71-135	-		30
Perfluoropentanoic Acid (PFPeA)	87		-		69-132	-		30
Perfluorobutanesulfonic Acid (PFBS)	86		-		72-128	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	91		-		62-145	-		30
Perfluorohexanoic Acid (PFHxA)	86		-		70-132	-		30
Perfluoropentanesulfonic Acid (PFPeS)	90		-		73-123	-		30
Perfluoroheptanoic Acid (PFHpA)	87		-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	97		-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	82		-		69-133	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	99		-		64-140	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	95		-		70-132	-		30
Perfluorononanoic Acid (PFNA)	88		-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	96		-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	87		-		69-133	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	102		-		65-137	-		30
Perfluorononanesulfonic Acid (PFNS)	100		-		69-125	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	91		-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	83		-		64-136	-		30
Perfluorodecanesulfonic Acid (PFDS)	93		-		59-134	-		30
Perfluorooctanesulfonamide (FOSA)	82		-		67-137	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	92		-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	89		-		69-135	-		30

Lab Control Sample Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 Batch: WG1614223-2								
Perfluorotridecanoic Acid (PFTTrDA)	102		-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	87		-		69-133	-		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCSD %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	98				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	99				58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	102				74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	54				14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	95				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	96				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104				78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	104				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	66				20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100				72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96				79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	100				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	66				19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	74				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	110				61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	89				10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	80				34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	100				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104				24-159

Matrix Spike Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1614223-3 QC Sample: L2211112-01 Client ID: 6-24 A (0-1)												
Perfluorobutanoic Acid (PFBA)	0.084J	5.67	4.97	86		-	-		71-135	-		30
Perfluoropentanoic Acid (PFPeA)	0.055J	5.67	4.89	85		-	-		69-132	-		30
Perfluorobutanesulfonic Acid (PFBS)	ND	5.04	4.40	87		-	-		72-128	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	5.31	5.00	94		-	-		62-145	-		30
Perfluorohexanoic Acid (PFHxA)	ND	5.67	4.95	87		-	-		70-132	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	5.33	4.82	90		-	-		73-123	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	5.67	5.00	88		-	-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	5.18	5.11	99		-	-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	ND	5.67	4.70	83		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	5.4	5.14	95		-	-		64-140	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	5.41	5.03	93		-	-		70-132	-		30
Perfluorononanoic Acid (PFNA)	ND	5.67	5.25	93		-	-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	0.318	5.26	5.34	95		-	-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	ND	5.67	4.88	86		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	5.44	5.44	100		-	-		65-137	-		30
Perfluorononanesulfonic Acid (PFNS)	ND	5.46	5.69	104		-	-		69-125	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	5.67	4.60	81		-	-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	5.67	5.00	88		-	-		64-136	-		30
Perfluorodecanesulfonic Acid (PFDS)	ND	5.48	5.60	102		-	-		59-134	-		30
Perfluorooctanesulfonamide (FOSA)	ND	5.67	4.65	82		-	-		67-137	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	5.67	4.85	86		-	-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	ND	5.67	5.15	91		-	-		69-135	-		30

Matrix Spike Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1614223-3 QC Sample: L2211112-01 Client ID: 6-24 A (0-1)												
Perfluorotridecanoic Acid (PFTTrDA)	ND	5.67	5.50	97		-	-		66-139	-		30
Perfluorotetradecanoic Acid (PFTTA)	ND	5.67	4.74	84		-	-		69-133	-		30

Surrogate (Extracted Internal Standard)	MS % Recovery	MS Qualifier	MSD % Recovery	MSD Qualifier	Acceptance Criteria
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	78				19-175
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	57				14-167
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	71				20-154
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	63				34-137
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	49				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	109				61-155
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	103				75-130
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	88				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	90				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	102				78-139
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	108				24-159
Perfluoro[13C4]Butanoic Acid (MPFBA)	95				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	97				58-150
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	78				10-117
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95				79-136
Perfluoro[13C8]Octanoic Acid (M8PFOA)	99				75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96				72-140
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98				74-139

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: 6-24 A (1-2)						
Perfluorobutanoic Acid (PFBA)	0.057J	0.061J	ng/g	NC		30
Perfluoropentanoic Acid (PFPeA)	ND	ND	ng/g	NC		30
Perfluorobutanesulfonic Acid (PFBS)	ND	ND	ng/g	NC		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	ND	ng/g	NC		30
Perfluorohexanoic Acid (PFHxA)	0.068J	0.081J	ng/g	NC		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	ND	ng/g	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/g	NC		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/g	NC		30
Perfluorooctanoic Acid (PFOA)	0.115J	0.138J	ng/g	NC		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	ND	ng/g	NC		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	ND	ng/g	NC		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonic Acid (PFOS)	0.361	0.425	ng/g	16		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/g	NC		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	ND	ng/g	NC		30
Perfluorononanesulfonic Acid (PFNS)	ND	ND	ng/g	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/g	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/g	NC		30
Perfluorodecanesulfonic Acid (PFDS)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonamide (FOSA)	ND	ND	ng/g	NC		30

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: 6-24 A (1-2)						
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/g	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/g	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/g	NC		30
Perfluorotetradecanoic Acid (PFTA)	0.130J	0.153J	ng/g	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	86		86		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	93		93		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	96		98		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	63		63		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	97		96		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	87		86		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	105		105		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93		94		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	69		74		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	125		124		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	101		103		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	96		97		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	75		73		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	19	Q	18	Q	31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96		101		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	80		83		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	27	Q	20	Q	34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	91		100		54-150

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: 6-24 A (1-2)						

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	89		90		24-159

INORGANICS & MISCELLANEOUS

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-01
Client ID: 6-24 A (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	86.2		%	0.100	0.100	1	-	03/04/22 14:29	121,2540G	AL



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-02
Client ID: 6-24 A (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 09:55
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	88.9		%	0.100	0.100	1	-	03/04/22 14:29	121,2540G	AL



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-03
Client ID: 6-24 B (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	87.6		%	0.100	0.100	1	-	03/04/22 14:29	121,2540G	AL



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211112-04
Client ID: 6-24 B (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/02/22 12:15
Date Received: 03/03/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	84.7		%	0.100	0.100	1	-	03/04/22 14:29	121,2540G	AL



Project Name: HYA**Lab Number:** L2211112**Project Number:** Not Specified**Report Date:** 03/14/22**Sample Receipt and Container Information**

Were project specific reporting limits specified?

YES

Cooler Information**Cooler** **Custody Seal**

A Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2211112-01A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(14)
L2211112-01B	Plastic 2oz unpreserved for TS	A	NA		4.8	Y	Absent		A2-TS(7)
L2211112-02A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(14)
L2211112-02B	Plastic 2oz unpreserved for TS	A	NA		4.8	Y	Absent		A2-TS(7)
L2211112-03A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(14)
L2211112-03B	Plastic 2oz unpreserved for TS	A	NA		4.8	Y	Absent		A2-TS(7)
L2211112-04A	Plastic 8oz unpreserved	A	NA		4.8	Y	Absent		A2-537-ISOTOPE(14)
L2211112-04B	Plastic 2oz unpreserved for TS	A	NA		4.8	Y	Absent		A2-TS(7)

Project Name: HYA

Serial_No:03142214:56
Lab Number: L2211112

Project Number:

Report Date: 03/14/22

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA, this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

Data Qualifiers

- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)
- Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211112
Report Date: 03/14/22

REFERENCES

- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.
- 134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Alpha Analytical, Inc.Facility: **Company-wide**Department: **Quality Assurance**Title: **Certificate/Approval Program Summary**ID No.: **17873**

Revision 19

Published Date: 4/2/2021 1:14:23 PM

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Certification Information**The following analytes are not included in our Primary NELAP Scope of Accreditation:****Westborough Facility****EPA 624/624.1:** m/p-xylene, o-xylene, Naphthalene**EPA 625/625.1:** alpha-Terpineol**EPA 8260C/8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.**EPA 8270D/8270E:** NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.**SM4500:** NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.**Mansfield Facility****SM 2540D:** TSS**EPA 8082A:** NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B**The following analytes are included in our Massachusetts DEP Scope of Accreditation****Westborough Facility:****Drinking Water****EPA 300.0:** Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,****EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B****EPA 332:** Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.**Microbiology:** **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.****Non-Potable Water****SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1:**Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,****SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300:** Chloride, Sulfate, Nitrate.**EPA 624.1:** Volatile Halocarbons & Aromatics,**EPA 608.3:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.**Microbiology:** **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.****Mansfield Facility:****Drinking Water****EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1 Hg.****EPA 522, EPA 537.1.****Non-Potable Water****EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.**EPA 245.1 Hg.****SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



ANALYTICAL REPORT

Lab Number:	L2211695
Client:	Horseley & Witten, Inc. Sextant Hill Office Park 90 Route 6A Sandwich, MA 02563
ATTN:	Brian Massa
Phone:	(508) 833-6600
Project Name:	HYA
Project Number:	Not Specified
Report Date:	03/14/22

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Certifications & Approvals: MA (M-MA030), NH NELAP (2062), CT (PH-0141), DoD (L2474), FL (E87814), IL (200081), LA (85084), ME (MA00030), MD (350), NJ (MA015), NY (11627), NC (685), OH (CL106), PA (68-02089), RI (LAO00299), TX (T104704419), VT (VT-0015), VA (460194), WA (C954), US Army Corps of Engineers, USDA (Permit #P330-17-00150), USFWS (Permit #206964).

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Alpha Sample ID	Client ID	Matrix	Sample Location	Collection Date/Time	Receive Date
L2211695-01	6-24 C (0-1)	SOIL	HYANNIS, MA	03/04/22 09:50	03/07/22
L2211695-02	6-24 C (1-2)	SOIL	HYANNIS, MA	03/04/22 09:50	03/07/22

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

MADEP MCP Response Action Analytical Report Certification

This form provides certifications for all samples performed by MCP methods. Please refer to the Sample Results and Container Information sections of this report for specification of MCP methods used for each analysis. The following questions pertain only to MCP Analytical Methods.

An affirmative response to questions A through F is required for "Presumptive Certainty" status		
A	Were all samples received in a condition consistent with those described on the Chain-of-Custody, properly preserved (including temperature) in the field or laboratory, and prepared/analyzed within method holding times?	YES
B	Were the analytical method(s) and all associated QC requirements specified in the selected CAM protocol(s) followed?	YES
C	Were all required corrective actions and analytical response actions specified in the selected CAM protocol(s) implemented for all identified performance standard non-conformances?	YES
D	Does the laboratory report comply with all the reporting requirements specified in CAM VII A, "Quality Assurance and Quality Control Guidelines for the Acquisition and Reporting of Analytical Data?"	YES
E a.	VPH, EPH, and APH Methods only: Was each method conducted without significant modification(s)? (Refer to the individual method(s) for a list of significant modifications).	N/A
E b.	APH and TO-15 Methods only: Was the complete analyte list reported for each method?	N/A
F	Were all applicable CAM protocol QC and performance standard non-conformances identified and evaluated in a laboratory narrative (including all "No" responses to Questions A through E)?	YES
A response to questions G, H and I is required for "Presumptive Certainty" status		
G	Were the reporting limits at or below all CAM reporting limits specified in the selected CAM protocol(s)?	YES
H	Were all QC performance standards specified in the CAM protocol(s) achieved?	YES
I	Were results reported for the complete analyte list specified in the selected CAM protocol(s)?	YES
For any questions answered "No", please refer to the case narrative section on the following page(s).		

Please note that sample matrix information is located in the Sample Results section of this report.



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
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Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
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Case Narrative (continued)

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

MCP Related Narratives

Report Submission

All MCP required questions were answered with affirmative responses; therefore, there are no relevant protocol-specific QC and/or performance standard non-conformances to report.

Non MCP Related Narratives

Perfluorinated Alkyl Acids by Isotope Dilution

L2211695-01 and -02: Extracted Internal Standard recoveries were outside the acceptance criteria for individual analytes. Please refer to the surrogate section of the report for details.

WG1614223-1R and WG1614223-2R: The sample was re-analyzed due to QC failures in the original analysis. The results of the re-analysis are reported.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature:

 Cristin Walker

Title: Technical Director/Representative

Date: 03/14/22

QC OUTLIER SUMMARY REPORT

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Method	Client ID (Native ID)	Lab ID	Parameter	QC Type	Recovery/RPD (%)	QC Limits (%)	Associated Samples	Data Quality Assessment
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab								
LCMSMS-ID	6-24 C (0-1)	L2211695-01	Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	Surrogate	76	79-136	-	- - not applicable - -
LCMSMS-ID	6-24 C (0-1)	L2211695-01	Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	Surrogate	74	75-130	-	- - not applicable - -
LCMSMS-ID	6-24 C (0-1)	L2211695-01	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	21	31-134	-	- - not applicable - -
LCMSMS-ID	6-24 C (0-1)	L2211695-01	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	24	34-137	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	Surrogate	66	71-129	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	Perfluoro[13C8]Octanoic Acid (M8PFOA)	Surrogate	70	75-130	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	Surrogate	78	79-136	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	Surrogate	70	75-130	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	7	31-134	-	- - not applicable - -
LCMSMS-ID	6-24 C (1-2)	L2211695-02	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	7	34-137	-	- - not applicable - -
LCMSMS-ID	Batch QC (L2211112-02)	WG1614223-4	N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	Surrogate	18	31-134	-	- - not applicable - -
LCMSMS-ID	Batch QC (L2211112-02)	WG1614223-4	N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	Surrogate	20	34-137	-	- - not applicable - -

ORGANICS

SEMIVOLATILES

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-01
Client ID: 6-24 C (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/11/22 02:44
Analyst: HT
Percent Solids: 75%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.091	J	ng/g	0.609	0.028	1
Perfluoropentanoic Acid (PFPeA)	0.065	J	ng/g	0.609	0.056	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.304	0.048	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.22	0.079	1
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.609	0.064	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.22	0.102	1
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.304	0.055	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.304	0.074	1
Perfluorooctanoic Acid (PFOA)	0.058	J	ng/g	0.304	0.051	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.609	0.219	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.609	0.166	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.304	0.091	1
Perfluorooctanesulfonic Acid (PFOS)	0.654		ng/g	0.304	0.158	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.304	0.082	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.609	0.350	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.22	0.364	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.609	0.246	1
Perfluoroundecanoic Acid (PFUnA)	0.099	J	ng/g	0.609	0.057	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.609	0.186	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.609	0.119	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.609	0.103	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.609	0.085	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.609	0.249	1
Perfluorotetradecanoic Acid (PFTA)	0.156	J	ng/g	0.609	0.066	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-01
Client ID: 6-24 C (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Surrogate (Extracted Internal Standard)	% Recovery			Qualifier	Acceptance Criteria	
Perfluoro[13C4]Butanoic Acid (MPFBA)	74				61-135	
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	79				58-150	
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	81				74-139	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	53				14-167	
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	84				66-128	
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	72				71-129	
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	83				78-139	
Perfluoro[13C8]Octanoic Acid (M8PFOA)	75				75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	62				20-154	
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	101				72-140	
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	76			Q	79-136	
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	74			Q	75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	57				19-175	
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	21			Q	31-134	
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	71				61-155	
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	65				10-117	
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	24			Q	34-137	
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	63				54-150	
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	29				24-159	

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-02
Client ID: 6-24 C (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:

Matrix: Soil
Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/11/22 03:01
Analyst: HT
Percent Solids: 83%

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Perfluorobutanoic Acid (PFBA)	0.055	J	ng/g	0.566	0.026	1
Perfluoropentanoic Acid (PFPeA)	0.064	J	ng/g	0.566	0.052	1
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.283	0.044	1
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.13	0.073	1
Perfluorohexanoic Acid (PFHxA)	0.073	JF	ng/g	0.566	0.059	1
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.13	0.095	1
Perfluoroheptanoic Acid (PFHpA)	0.079	J	ng/g	0.283	0.051	1
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.283	0.069	1
Perfluorooctanoic Acid (PFOA)	0.156	J	ng/g	0.283	0.047	1
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.566	0.203	1
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.566	0.154	1
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.283	0.085	1
Perfluorooctanesulfonic Acid (PFOS)	0.297		ng/g	0.283	0.147	1
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.283	0.076	1
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.566	0.325	1
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.13	0.339	1
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.566	0.228	1
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.566	0.053	1
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.566	0.173	1
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.566	0.111	1
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.566	0.096	1
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.566	0.079	1
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.566	0.232	1
Perfluorotetradecanoic Acid (PFTA)	0.126	JF	ng/g	0.566	0.061	1

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-02
Client ID: 6-24 C (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab						
Surrogate (Extracted Internal Standard)	% Recovery			Qualifier	Acceptance Criteria	
Perfluoro[13C4]Butanoic Acid (MPFBA)	68				61-135	
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	72				58-150	
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	81				74-139	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	50				14-167	
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	76				66-128	
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	66			Q	71-129	
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	85				78-139	
Perfluoro[13C8]Octanoic Acid (M8PFOA)	70			Q	75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	58				20-154	
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	92				72-140	
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	78			Q	79-136	
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	70			Q	75-130	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	53				19-175	
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	7			Q	31-134	
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	68				61-155	
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	79				10-117	
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	7			Q	34-137	
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	62				54-150	
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	27				24-159	

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Method Blank Analysis Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/12/22 09:02
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-02 Batch: WG1614223-1 R					
Perfluorobutanoic Acid (PFBA)	ND		ng/g	0.500	0.023
Perfluoropentanoic Acid (PFPeA)	ND		ng/g	0.500	0.046
Perfluorobutanesulfonic Acid (PFBS)	ND		ng/g	0.250	0.039
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND		ng/g	1.00	0.065
Perfluorohexanoic Acid (PFHxA)	ND		ng/g	0.500	0.053
Perfluoropentanesulfonic Acid (PFPeS)	ND		ng/g	1.00	0.084
Perfluoroheptanoic Acid (PFHpA)	ND		ng/g	0.250	0.045
Perfluorohexanesulfonic Acid (PFHxS)	ND		ng/g	0.250	0.061
Perfluorooctanoic Acid (PFOA)	ND		ng/g	0.250	0.042
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND		ng/g	0.500	0.180
Perfluoroheptanesulfonic Acid (PFHpS)	ND		ng/g	0.500	0.136
Perfluorononanoic Acid (PFNA)	ND		ng/g	0.250	0.075
Perfluorooctanesulfonic Acid (PFOS)	ND		ng/g	0.250	0.130
Perfluorodecanoic Acid (PFDA)	ND		ng/g	0.250	0.067
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND		ng/g	0.500	0.287
Perfluorononanesulfonic Acid (PFNS)	ND		ng/g	1.00	0.299
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND		ng/g	0.500	0.202
Perfluoroundecanoic Acid (PFUnA)	ND		ng/g	0.500	0.047
Perfluorodecanesulfonic Acid (PFDS)	ND		ng/g	0.500	0.153
Perfluorooctanesulfonamide (FOSA)	ND		ng/g	0.500	0.098
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND		ng/g	0.500	0.085
Perfluorododecanoic Acid (PFDoA)	ND		ng/g	0.500	0.070
Perfluorotridecanoic Acid (PFTrDA)	ND		ng/g	0.500	0.204
Perfluorotetradecanoic Acid (PFTA)	ND		ng/g	0.500	0.054

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Method Blank Analysis Batch Quality Control

Analytical Method: 134,LCMSMS-ID
Analytical Date: 03/12/22 09:02
Analyst: RS

Extraction Method: ALPHA 23528
Extraction Date: 03/10/22 17:00

Parameter	Result	Qualifier	Units	RL	MDL
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab for sample(s): 01-02 Batch: WG1614223-1 R					

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	101		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	104		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	104		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	54		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	94		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	96		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	110		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	107		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	64		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	103		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	105		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	104		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	66		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	77		31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	113		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	82		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	85		34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105		54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	100		24-159

Lab Control Sample Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 Batch: WG1614223-2								
Perfluorobutanoic Acid (PFBA)	86		-		71-135	-		30
Perfluoropentanoic Acid (PFPeA)	87		-		69-132	-		30
Perfluorobutanesulfonic Acid (PFBS)	86		-		72-128	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	91		-		62-145	-		30
Perfluorohexanoic Acid (PFHxA)	86		-		70-132	-		30
Perfluoropentanesulfonic Acid (PFPeS)	90		-		73-123	-		30
Perfluoroheptanoic Acid (PFHpA)	87		-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	97		-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	82		-		69-133	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	99		-		64-140	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	95		-		70-132	-		30
Perfluorononanoic Acid (PFNA)	88		-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	96		-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	87		-		69-133	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	102		-		65-137	-		30
Perfluorononanesulfonic Acid (PFNS)	100		-		69-125	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	91		-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	83		-		64-136	-		30
Perfluorodecanesulfonic Acid (PFDS)	93		-		59-134	-		30
Perfluorooctanesulfonamide (FOSA)	82		-		67-137	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	92		-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	89		-		69-135	-		30

Lab Control Sample Analysis **Batch Quality Control**

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	LCS %Recovery	Qual	LCS %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 Batch: WG1614223-2								
Perfluorotridecanoic Acid (PFTTrDA)	102		-		66-139	-		30
Perfluorotetradecanoic Acid (PFTA)	87		-		69-133	-		30

Surrogate (Extracted Internal Standard)	LCS %Recovery	Qual	LCS %Recovery	Qual	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	98				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	99				58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	102				74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	54				14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	95				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	96				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	104				78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	104				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	66				20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	100				72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	96				79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	100				75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	66				19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	74				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	110				61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	89				10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	80				34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	100				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	104				24-159

Matrix Spike Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1614223-3 QC Sample: L2211112-01 Client ID: MS Sample												
Perfluorobutanoic Acid (PFBA)	0.084J	5.67	4.97	86		-	-		71-135	-		30
Perfluoropentanoic Acid (PFPeA)	0.055J	5.67	4.89	85		-	-		69-132	-		30
Perfluorobutanesulfonic Acid (PFBS)	ND	5.04	4.40	87		-	-		72-128	-		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	5.31	5.00	94		-	-		62-145	-		30
Perfluorohexanoic Acid (PFHxA)	ND	5.67	4.95	87		-	-		70-132	-		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	5.33	4.82	90		-	-		73-123	-		30
Perfluoroheptanoic Acid (PFHpA)	ND	5.67	5.00	88		-	-		71-131	-		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	5.18	5.11	99		-	-		67-130	-		30
Perfluorooctanoic Acid (PFOA)	ND	5.67	4.70	83		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	5.4	5.14	95		-	-		64-140	-		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	5.41	5.03	93		-	-		70-132	-		30
Perfluorononanoic Acid (PFNA)	ND	5.67	5.25	93		-	-		72-129	-		30
Perfluorooctanesulfonic Acid (PFOS)	0.318	5.26	5.34	95		-	-		68-136	-		30
Perfluorodecanoic Acid (PFDA)	ND	5.67	4.88	86		-	-		69-133	-		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	5.44	5.44	100		-	-		65-137	-		30
Perfluorononanesulfonic Acid (PFNS)	ND	5.46	5.69	104		-	-		69-125	-		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	5.67	4.60	81		-	-		63-144	-		30
Perfluoroundecanoic Acid (PFUnA)	ND	5.67	5.00	88		-	-		64-136	-		30
Perfluorodecanesulfonic Acid (PFDS)	ND	5.48	5.60	102		-	-		59-134	-		30
Perfluorooctanesulfonamide (FOSA)	ND	5.67	4.65	82		-	-		67-137	-		30
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	5.67	4.85	86		-	-		61-139	-		30
Perfluorododecanoic Acid (PFDoA)	ND	5.67	5.15	91		-	-		69-135	-		30

Matrix Spike Analysis

Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	Native Sample	MS Added	MS Found	MS %Recovery	Qual	MSD Found	MSD %Recovery	Qual	Recovery Limits	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1614223-3 QC Sample: L2211112-01 Client ID: MS Sample												
Perfluorotridecanoic Acid (PFTTrDA)	ND	5.67	5.50	97		-	-		66-139	-		30
Perfluorotetradecanoic Acid (PFTTA)	ND	5.67	4.74	84		-	-		69-133	-		30

Surrogate (Extracted Internal Standard)	MS		MSD		Acceptance Criteria
	% Recovery	Qualifier	% Recovery	Qualifier	
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	78				19-175
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	57				14-167
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	71				20-154
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	63				34-137
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	49				31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	109				61-155
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	103				75-130
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	88				66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	90				71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	102				78-139
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	105				54-150
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	108				24-159
Perfluoro[13C4]Butanoic Acid (MPFBA)	95				61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	97				58-150
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	78				10-117
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	95				79-136
Perfluoro[13C8]Octanoic Acid (M8PFOA)	99				75-130
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	96				72-140
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	98				74-139

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: DUP Sample						
Perfluorobutanoic Acid (PFBA)	0.057J	0.061J	ng/g	NC		30
Perfluoropentanoic Acid (PFPeA)	ND	ND	ng/g	NC		30
Perfluorobutanesulfonic Acid (PFBS)	ND	ND	ng/g	NC		30
1H,1H,2H,2H-Perfluorohexanesulfonic Acid (4:2FTS)	ND	ND	ng/g	NC		30
Perfluorohexanoic Acid (PFHxA)	0.068J	0.081J	ng/g	NC		30
Perfluoropentanesulfonic Acid (PFPeS)	ND	ND	ng/g	NC		30
Perfluoroheptanoic Acid (PFHpA)	ND	ND	ng/g	NC		30
Perfluorohexanesulfonic Acid (PFHxS)	ND	ND	ng/g	NC		30
Perfluorooctanoic Acid (PFOA)	0.115J	0.138J	ng/g	NC		30
1H,1H,2H,2H-Perfluorooctanesulfonic Acid (6:2FTS)	ND	ND	ng/g	NC		30
Perfluoroheptanesulfonic Acid (PFHpS)	ND	ND	ng/g	NC		30
Perfluorononanoic Acid (PFNA)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonic Acid (PFOS)	0.361	0.425	ng/g	16		30
Perfluorodecanoic Acid (PFDA)	ND	ND	ng/g	NC		30
1H,1H,2H,2H-Perfluorodecanesulfonic Acid (8:2FTS)	ND	ND	ng/g	NC		30
Perfluorononanesulfonic Acid (PFNS)	ND	ND	ng/g	NC		30
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMeFOSAA)	ND	ND	ng/g	NC		30
Perfluoroundecanoic Acid (PFUnA)	ND	ND	ng/g	NC		30
Perfluorodecanesulfonic Acid (PFDS)	ND	ND	ng/g	NC		30
Perfluorooctanesulfonamide (FOSA)	ND	ND	ng/g	NC		30

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: DUP Sample						
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NEtFOSAA)	ND	ND	ng/g	NC		30
Perfluorododecanoic Acid (PFDoA)	ND	ND	ng/g	NC		30
Perfluorotridecanoic Acid (PFTrDA)	ND	ND	ng/g	NC		30
Perfluorotetradecanoic Acid (PFTA)	0.130J	0.153J	ng/g	NC		30

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[13C4]Butanoic Acid (MPFBA)	86		86		61-135
Perfluoro[13C5]Pentanoic Acid (M5PFPEA)	93		93		58-150
Perfluoro[2,3,4-13C3]Butanesulfonic Acid (M3PFBS)	96		98		74-139
1H,1H,2H,2H-Perfluoro[1,2-13C2]Hexanesulfonic Acid (M2-4:2FTS)	63		63		14-167
Perfluoro[1,2,3,4,6-13C5]Hexanoic Acid (M5PFHxA)	97		96		66-128
Perfluoro[1,2,3,4-13C4]Heptanoic Acid (M4PFHpA)	87		86		71-129
Perfluoro[1,2,3-13C3]Hexanesulfonic Acid (M3PFHxS)	105		105		78-139
Perfluoro[13C8]Octanoic Acid (M8PFOA)	93		94		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Octanesulfonic Acid (M2-6:2FTS)	69		74		20-154
Perfluoro[13C9]Nonanoic Acid (M9PFNA)	125		124		72-140
Perfluoro[13C8]Octanesulfonic Acid (M8PFOS)	101		103		79-136
Perfluoro[1,2,3,4,5,6-13C6]Decanoic Acid (M6PFDA)	96		97		75-130
1H,1H,2H,2H-Perfluoro[1,2-13C2]Decanesulfonic Acid (M2-8:2FTS)	75		73		19-175
N-Deuteriomethylperfluoro-1-octanesulfonamidoacetic Acid (d3-NMeFOSAA)	19	Q	18	Q	31-134
Perfluoro[1,2,3,4,5,6,7-13C7]Undecanoic Acid (M7-PFUDA)	96		101		61-155
Perfluoro[13C8]Octanesulfonamide (M8FOSA)	80		83		10-117
N-Deuterioethylperfluoro-1-octanesulfonamidoacetic Acid (d5-NEtFOSAA)	27	Q	20	Q	34-137
Perfluoro[1,2-13C2]Dodecanoic Acid (MPFDOA)	91		100		54-150

Lab Duplicate Analysis Batch Quality Control

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Perfluorinated Alkyl Acids by Isotope Dilution - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1614223-4 QC Sample: L2211112-02 Client ID: DUP Sample						

Surrogate (Extracted Internal Standard)	%Recovery	Qualifier	%Recovery	Qualifier	Acceptance Criteria
Perfluoro[1,2-13C2]Tetradecanoic Acid (M2PFTEDA)	89		90		24-159

INORGANICS & MISCELLANEOUS

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-01
Client ID: 6-24 C (0-1)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	75.3		%	0.100	0.100	1	-	03/09/22 11:03	121,2540G	AV



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

SAMPLE RESULTS

Lab ID: L2211695-02
Client ID: 6-24 C (1-2)
Sample Location: HYANNIS, MA

Date Collected: 03/04/22 09:50
Date Received: 03/07/22
Field Prep: Not Specified

Sample Depth:
Matrix: Soil

Parameter	Result	Qualifier	Units	RL	MDL	Dilution Factor	Date Prepared	Date Analyzed	Analytical Method	Analyst
General Chemistry - Mansfield Lab										
Solids, Total	83.3		%	0.100	0.100	1	-	03/09/22 11:03	121,2540G	AV



Project Name: HYA**Lab Number:** L2211695**Project Number:** Not Specified**Report Date:** 03/14/22**Sample Receipt and Container Information**

Were project specific reporting limits specified?

YES

Cooler Information**Cooler** **Custody Seal**

A Absent

Container Information

Container ID	Container Type	Cooler	Initial pH	Final pH	Temp deg C	Pres	Seal	Frozen Date/Time	Analysis(*)
L2211695-01A	Plastic 8oz unpreserved	A	NA		3.5	Y	Absent		A2-537-ISOTOPE(14)
L2211695-01B	Plastic 2oz unpreserved for TS	A	NA		3.5	Y	Absent		A2-TS(7)
L2211695-02A	Plastic 8oz unpreserved	A	NA		3.5	Y	Absent		A2-537-ISOTOPE(14)
L2211695-02B	Plastic 2oz unpreserved for TS	A	NA		3.5	Y	Absent		A2-TS(7)

Project Name: HYA

Project Number:

 Serial_No:03142214:55
 Lab Number: L2211695
 Report Date: 03/14/22

PFAS PARAMETER SUMMARY

Parameter	Acronym	CAS Number
PERFLUOROALKYL CARBOXYLIC ACIDS (PFCAs)		
Perfluorooctadecanoic Acid	PFODA	16517-11-6
Perfluorohexadecanoic Acid	PFHxDA	67905-19-5
Perfluorotetradecanoic Acid	PFTA	376-06-7
Perfluorotridecanoic Acid	PFTTrDA	72629-94-8
Perfluorododecanoic Acid	PFDoA	307-55-1
Perfluoroundecanoic Acid	PFUnA	2058-94-8
Perfluorodecanoic Acid	PFDA	335-76-2
Perfluorononanoic Acid	PFNA	375-95-1
Perfluorooctanoic Acid	PFOA	335-67-1
Perfluoroheptanoic Acid	PFHpA	375-85-9
Perfluorohexanoic Acid	PFHxA	307-24-4
Perfluoropentanoic Acid	PFPeA	2706-90-3
Perfluorobutanoic Acid	PFBA	375-22-4
PERFLUOROALKYL SULFONIC ACIDS (PFSAs)		
Perfluorododecanesulfonic Acid	PFDoDS	79780-39-5
Perfluorodecanesulfonic Acid	PFDS	335-77-3
Perfluorononanesulfonic Acid	PFNS	68259-12-1
Perfluorooctanesulfonic Acid	PFOS	1763-23-1
Perfluoroheptanesulfonic Acid	PFHpS	375-92-8
Perfluorohexanesulfonic Acid	PFHxS	355-46-4
Perfluoropentanesulfonic Acid	PFPeS	2706-91-4
Perfluorobutanesulfonic Acid	PFBS	375-73-5
FLUOROTELOMERS		
1H,1H,2H,2H-Perfluorododecanesulfonic Acid	10:2FTS	120226-60-0
1H,1H,2H,2H-Perfluorodecanesulfonic Acid	8:2FTS	39108-34-4
1H,1H,2H,2H-Perfluorooctanesulfonic Acid	6:2FTS	27619-97-2
1H,1H,2H,2H-Perfluorohexanesulfonic Acid	4:2FTS	757124-72-4
PERFLUOROALKANE SULFONAMIDES (FASAs)		
Perfluorooctanesulfonamide	FOSA	754-91-6
N-Ethyl Perfluorooctane Sulfonamide	NEtFOSA	4151-50-2
N-Methyl Perfluorooctane Sulfonamide	NMeFOSA	31506-32-8
PERFLUOROALKANE SULFONYL SUBSTANCES		
N-Ethyl Perfluorooctanesulfonamido Ethanol	NEtFOSE	1691-99-2
N-Methyl Perfluorooctanesulfonamido Ethanol	NMeFOSE	24448-09-7
N-Ethyl Perfluorooctanesulfonamidoacetic Acid	NEtFOSAA	2991-50-6
N-Methyl Perfluorooctanesulfonamidoacetic Acid	NMeFOSAA	2355-31-9
PER- and POLYFLUOROALKYL ETHER CARBOXYLIC ACIDS		
2,3,3,3-Tetrafluoro-2-[1,1,2,2,3,3,3-Heptafluoropropoxy]-Propanoic Acid	HFPO-DA	13252-13-6
4,8-Dioxa-3h-Perfluorononanoic Acid	ADONA	919005-14-4
CHLORO-PERFLUOROALKYL SULFONIC ACIDS		
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	11Cl-PF3OUdS	763051-92-9
9-Chlorohexadecafluoro-3-Oxanone-1-Sulfonic Acid	9Cl-PF3ONS	756426-58-1
PERFLUOROETHER SULFONIC ACIDS (PFESAs)		
Perfluoro(2-Ethoxyethane)Sulfonic Acid	PFEEESA	113507-82-7
PERFLUOROETHER/POLYETHER CARBOXYLIC ACIDS (PFPCAs)		
Perfluoro-3-Methoxypropanoic Acid	PFMPA	377-73-1
Perfluoro-4-Methoxybutanoic Acid	PFMBA	863090-89-5
Nonafluoro-3,6-Dioxaheptanoic Acid	NFDHA	151772-58-6

Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

GLOSSARY

Acronyms

DL	- Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
EDL	- Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).
EMPC	- Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.
EPA	- Environmental Protection Agency.
LCS	- Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LCSD	- Laboratory Control Sample Duplicate: Refer to LCS.
LFB	- Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.
LOD	- Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
LOQ	- Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)
MDL	- Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
MS	- Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.
MSD	- Matrix Spike Sample Duplicate: Refer to MS.
NA	- Not Applicable.
NC	- Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.
NDPA/DPA	- N-Nitrosodiphenylamine/Diphenylamine.
NI	- Not Ignitable.
NP	- Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.
NR	- No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.
RL	- Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.
RPD	- Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.
SRM	- Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.
STLP	- Semi-dynamic Tank Leaching Procedure per EPA Method 1315.
TEF	- Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.
TEQ	- Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.
TIC	- Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Footnotes

- 1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA, this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

Data Qualifiers

- A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.
- B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).
- C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.
- D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.
- E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.
- F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.
- G** - The concentration may be biased high due to matrix interferences (i.e. co-elution) with non-target compound(s). The result should be considered estimated.
- H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.
- I** - The lower value for the two columns has been reported due to obvious interference.
- J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively Identified Compounds (TICs).
- M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.
- ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

Data Qualifiers

- NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.
- P** - The RPD between the results for the two columns exceeds the method-specified criteria.
- Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)
- R** - Analytical results are from sample re-analysis.
- RE** - Analytical results are from sample re-extraction.
- S** - Analytical results are from modified screening analysis.
- V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)
- Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

Report Format: DU Report with 'J' Qualifiers



Project Name: HYA
Project Number: Not Specified

Lab Number: L2211695
Report Date: 03/14/22

REFERENCES

- 121 Standard Methods for the Examination of Water and Wastewater. APHA-AWWA-WEF. Standard Methods Online.
- 134 Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS) using Isotope Dilution. Alpha SOP 23528.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.



Alpha Analytical, Inc.Facility: **Company-wide**Department: **Quality Assurance**Title: **Certificate/Approval Program Summary**ID No.: **17873**

Revision 19

Published Date: 4/2/2021 1:14:23 PM

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Certification Information**The following analytes are not included in our Primary NELAP Scope of Accreditation:****Westborough Facility****EPA 624/624.1:** m/p-xylene, o-xylene, Naphthalene**EPA 625/625.1:** alpha-Terpineol**EPA 8260C/8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.**EPA 8270D/8270E:** NPW: Dimethylnaphthalene, 1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene, 1,4-Diphenylhydrazine.**SM4500:** NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO₂, NO₃.**Mansfield Facility****SM 2540D:** TSS**EPA 8082A:** NPW: PCB: 1, 5, 31, 87, 101, 110, 141, 151, 153, 180, 183, 187.**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene,

3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.

Biological Tissue Matrix: EPA 3050B**The following analytes are included in our Massachusetts DEP Scope of Accreditation****Westborough Facility:****Drinking Water****EPA 300.0:** Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2:** Nitrate-N, Nitrite-N; **SM4500NO3-F:** Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE,****EPA 180.1, SM2130B, SM4500CI-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B****EPA 332:** Perchlorate; **EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.**Microbiology:** **SM9215B; SM9223-P/A, SM9223B-Colilert-QT, SM9222D.****Non-Potable Water****SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1:**Ammonia-N, **LACHAT 10-107-06-1-B:** Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2:** Nitrate-N, **SM4500P-E, SM4500P-B, E, SM4500SO4-E,****SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300:** Chloride, Sulfate, Nitrate.**EPA 624.1:** Volatile Halocarbons & Aromatics,**EPA 608.3:** Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II,

Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs

EPA 625.1: SVOC (Acid/Base/Neutral Extractables), **EPA 600/4-81-045:** PCB-Oil.**Microbiology:** **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.****Mansfield Facility:****Drinking Water****EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1 Hg.****EPA 522, EPA 537.1.****Non-Potable Water****EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.**EPA 200.8:** Al, Sb, As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.**EPA 245.1 Hg.****SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.



CHAIN OF CUSTODY

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WESTBORO, MA
TEL: 508-898-8220
FAX: 508-898-9193

MANSFIELD, MA
TEL: 508-822-9300
FAX: 508-822-3288

Client Information

Client: Horsley Withen Group

Address: 90 Route 6A
Sandwich MA

Phone: (508) 833-6600

Fax:

Email: bmaissachysleywitten.

☐ These samples have been previously analyzed by Alpha

Other Project Specific Requirements/Comments/Detection Limits:

Project Information

Project Name: HYA

Project Location: Huayannis MFA

Project #:

Project Manager: Bryan Massa

ALPHA Quote #:

Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: _____ Time: _____

Date Rec'd in Lab: 5/7/22

Report Information - Data Deliverables

☐ FAX ☒ EMAIL
☐ ADEx ☐ Add'l Deliverables

Regulatory Requirements/Report Limits

State /Fed Program	Criteria
MIA MCP	

ALPHA Job #: 62211695

Billing Information

<input type="checkbox"/> Same as Client info	PO #:
--	-------

SAMPLE HANDLING

Filtration

☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
 (Please specify below)

Sample Specific Comments

TOTAL # BOTTLES

[illegible]

Container Type

Preservative

Relinquished By:

Date/Time

Received By:

Date/Time

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.